OIPE JC24
FEB 11 2002
PATENT & TRADEMARK OFFICE

UNITED STATES PATENT AND TRADEMARK OFFICE

Case No. MBHB 01-099)

PATENT

In the Application of:

Rudger Rubbert

Serial No. 09/834,593

Filed: April 13, 2001

For: Scanning System and Calibration Method for Capturing Precise Three-Dimensional Information of Objects

Confirmation no. 4535

Group Art Unit: 2621

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Technology Center 2600

TRANSMITTAL LETTER

Box Non-fee amendment
Commissioner of Patents
Washington DC 20231

In regard to the above identified application:

1. We are transmitting herewith the attached :

1. Submission of Formal Drawings
2. 51 sheets of formal drawings
3. Return Postcard

2. With respect to additional fees:

A. X No additional fee is required.
B. ___Attached is a check in the amount of $ ____ .
C. ___ Charge the total additional fee of $ _____ to our Deposit Account No. **13-2490**.

3. Please charge any additional fees or credit overpayment to Deposit Account No. **13-2490**. A duplicate copy of this sheet is enclosed.

4. CERTIFICATE OF MAILING UNDER 37 CFR § 1.8: The undersigned hereby certifies that this Transmittal Letter and the paper, as described in paragraph 1 hereinabove, are being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner of Patents, Box non-fee amendment, Washington, D.C. 20231, on this 3rd day of December, 2001.

By: Thomas A. Fairhall

Thomas A. Fairhall
Reg. No. 34591

McDONNELL BOEHNEN
HULBERT & BERGHOFF
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 913-0001

OIPE JC24
FEB 11 2002
PATENT & TRADEMARK OFFICE

UNITED STATES PATENT AND TRADEMARK OFFICE
(Case No. MBHB 01-099)

PATENT

#8
3-1-02

In the Application of:

Rudger Rubbert

Serial No. 09/834,593

Filed: April 13, 2001

For: Scanning System and Calibration Method for Capturing Precise Three-Dimensional Information of Objects

Confirmation no. 4535

Group Art Unit: 2621

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Technology Center 2600

SUBMISSION OF FORMAL DRAWINGS

Box Non-Fee Amendment
Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

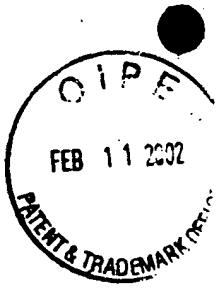
Applicants submit herewith 51 sheets of formal drawings for the above-referenced application. Approval of the drawings is requested.

Date: December 3, 2001

by: McDonnell Boehnen Hulbert & Berghoff

Thomas A. Fairhall
Reg. No. 34591

McDonnell Boehnen Hulbert & Berghoff
300 South Wacker Drive
Chicago, IL 60606
(312) 913-0001



CERTIFICATE OF MAILING

The undersigned hereby certifies that the foregoing SUBMISSION OF FORMAL DRAWINGS is being deposited as first class mail, postage prepaid, in an envelope addressed to Box Non-Fee Amendment, Commissioner of Patents, Washington DC 20231, on this 3rd day of December, 2001.

Thomas A. Fairhall

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300 South Wacker Drive
Chicago, IL 60606
(312) 913-0001

FIG. 1

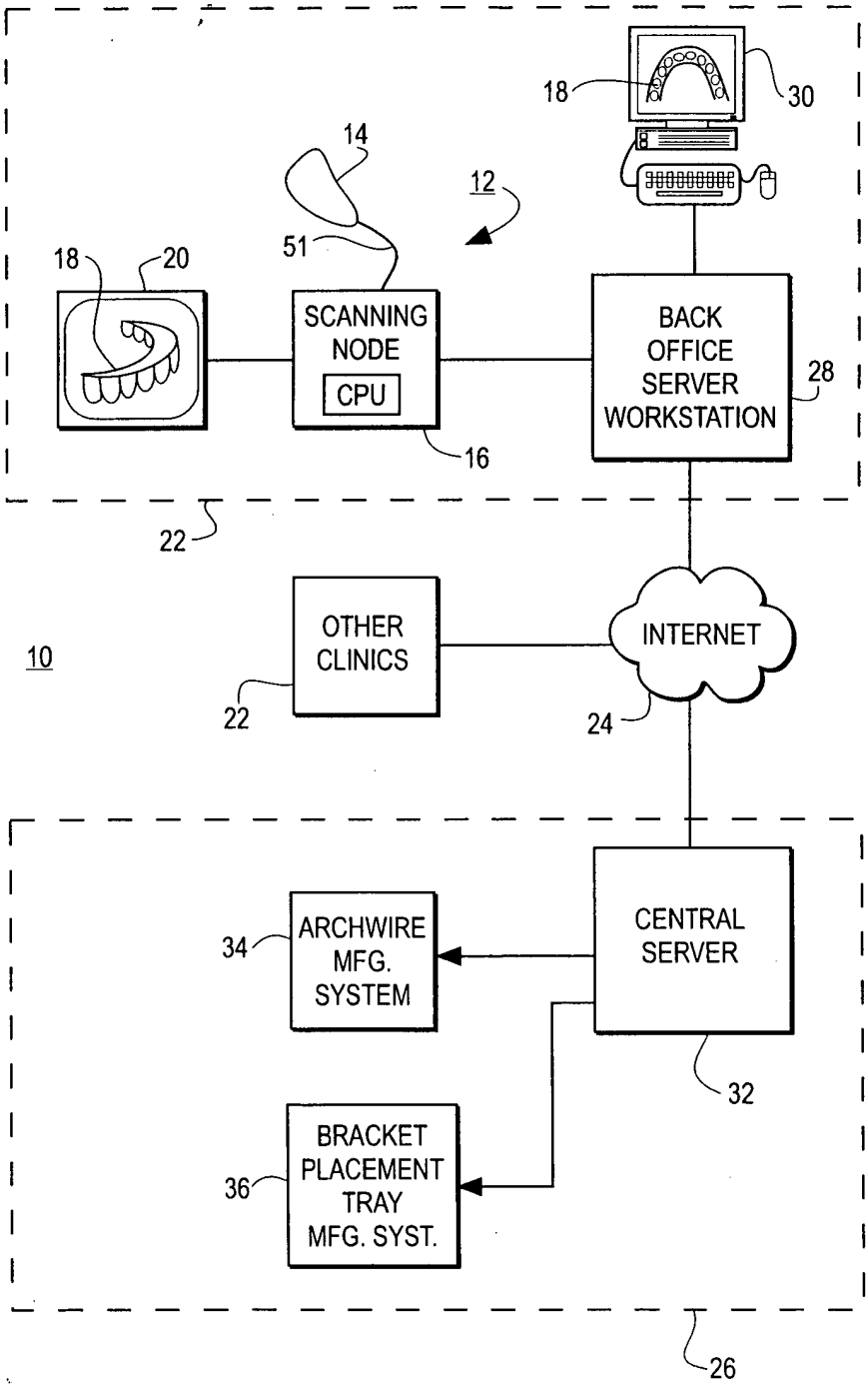

18
30
14
12
51
18
20
SCANNING NODE
CPU
BACK OFFICE SERVER WORKSTATION
28
16
22
10
OTHER CLINICS
INTERNET
22
24
CENTRAL SERVER
34
ARCHWIRE MFG. SYSTEM
32
36
BRACKET PLACEMENT TRAY MFG. SYST.
26

FIG. 2

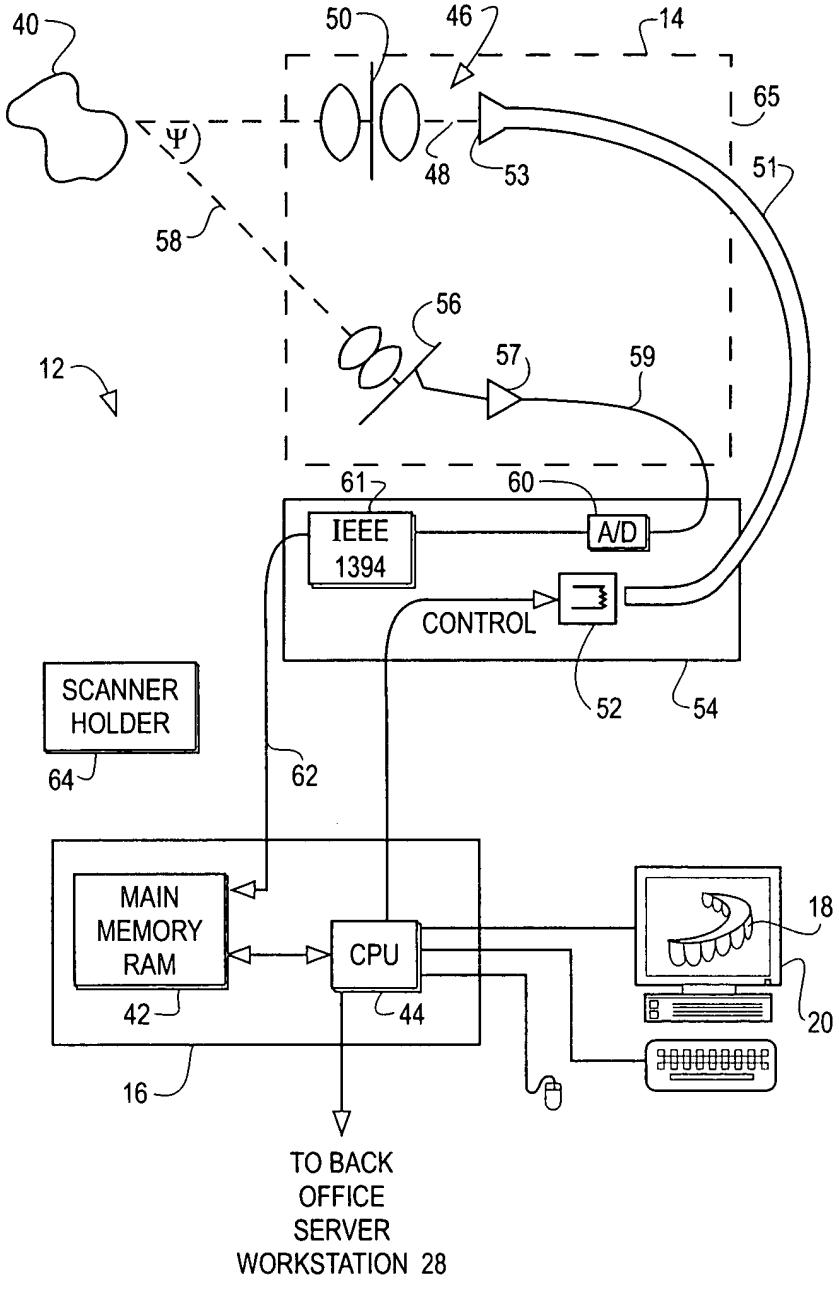

40
50
46
14
65
51
48
53
58
56
57
59
12
61
60
IEEE
1394
A/D
CONTROL
52
54
SCANNER
HOLDER
64
62
MAIN
MEMORY
RAM
42
CPU
44
18
20
16
TO BACK
OFFICE
SERVER
WORKSTATION 28

FIG. 3

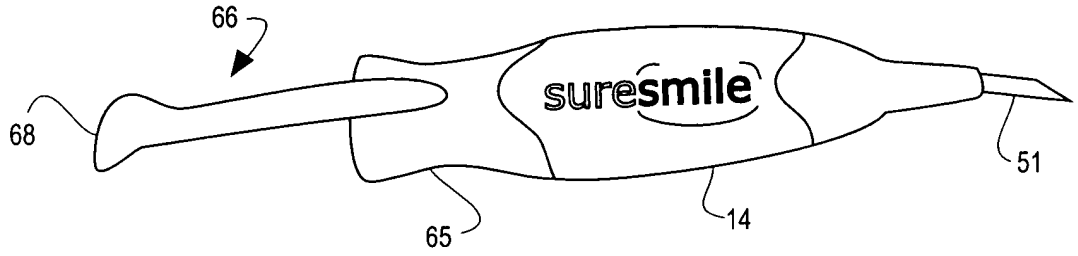


FIG. 4

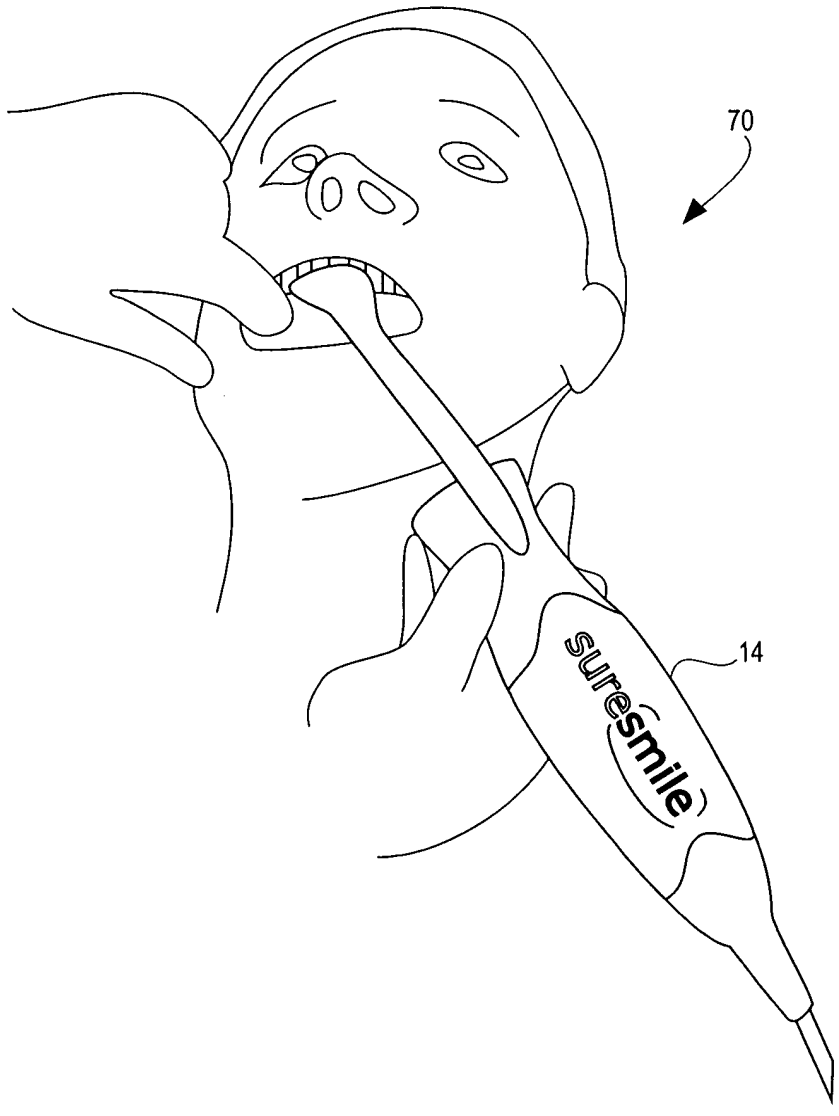


FIG. 5

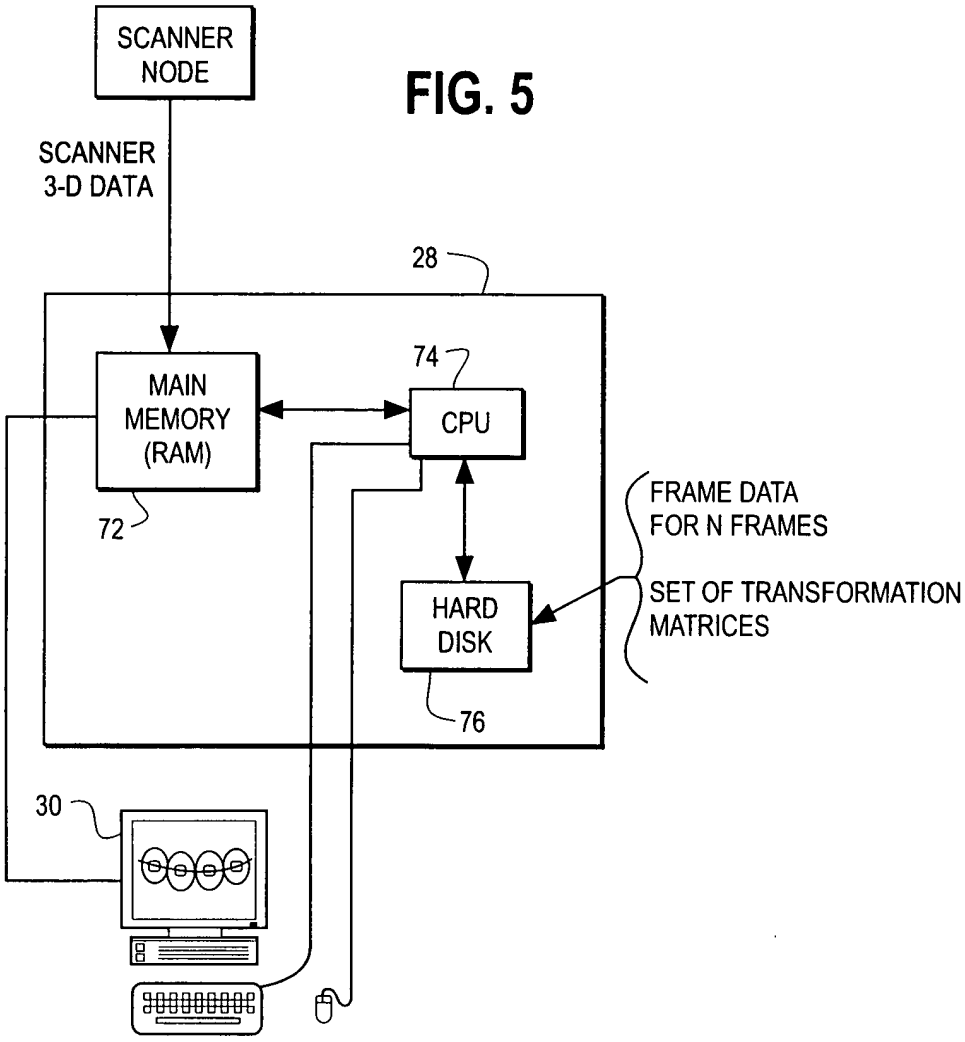

SCANNER NODE
SCANNER 3-D DATA
28
MAIN MEMORY (RAM)
72
74
CPU
HARD DISK
76
FRAME DATA FOR N FRAMES
SET OF TRANSFORMATION MATRICES
30

FIG. 6

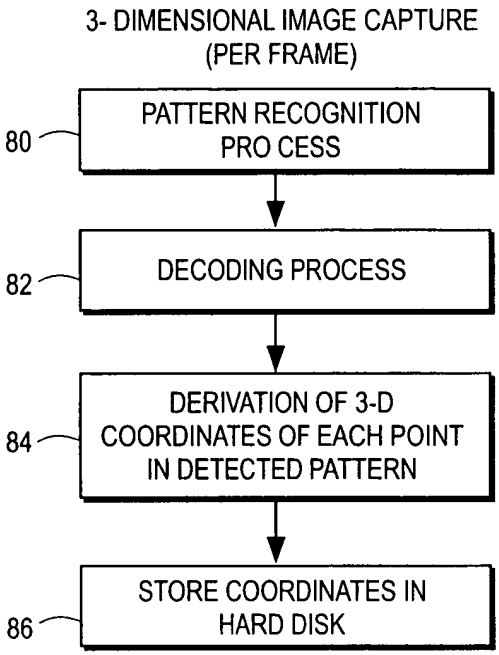

3- DIMENSIONAL IMAGE CAPTURE
(PER FRAME)
80
PATTERN RECOGNITION
PRO CESS
82
DECODING PROCESS
84
DERIVATION OF 3-D
COORDINATES OF EACH POINT
IN DETECTED PATTERN
86
STORE COORDINATES IN
HARD DISK

FIG. 7

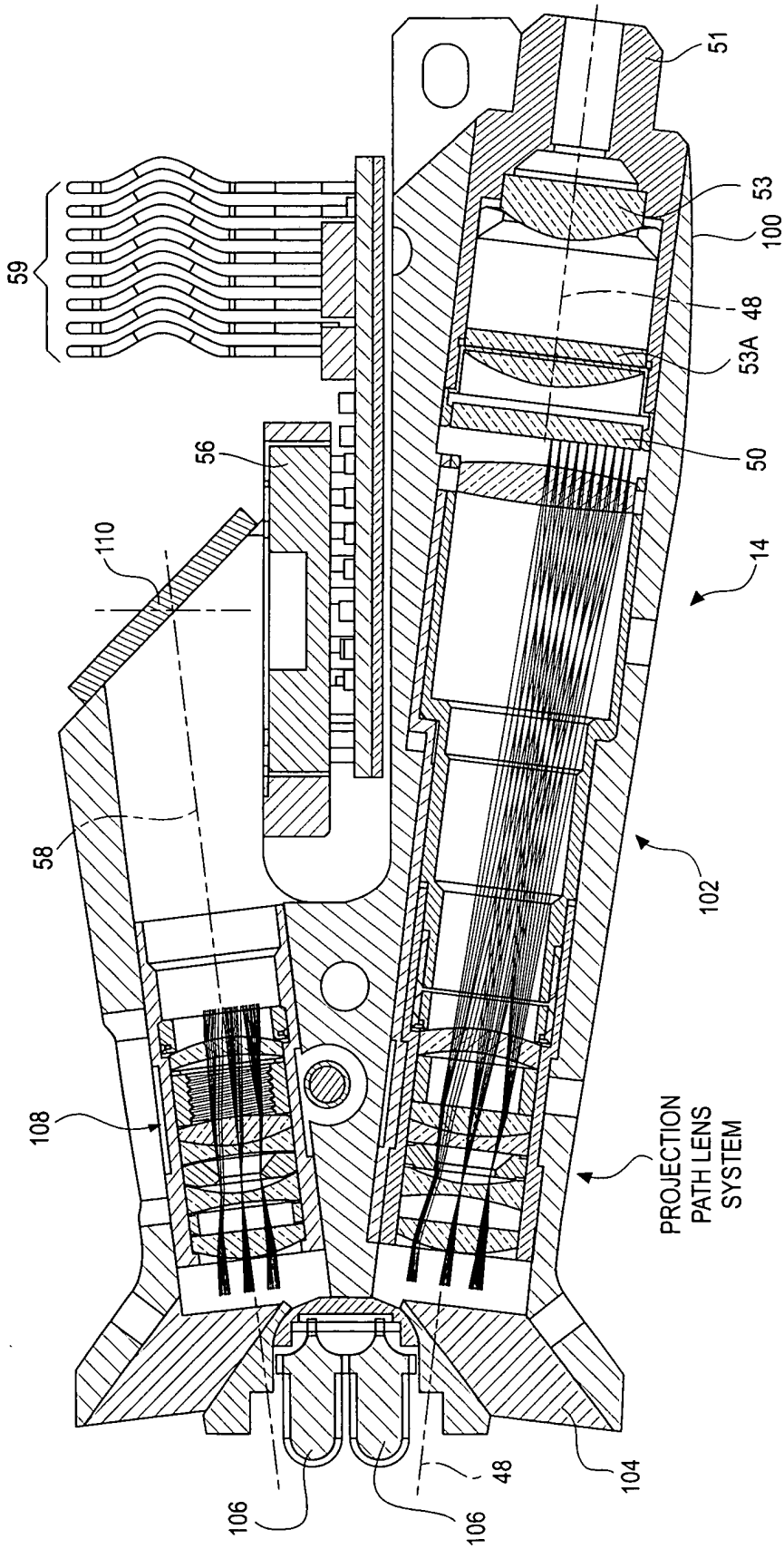

51
53
100
48
53A
50
14
59
56
110
58
102
108
PROJECTION
PATH LENS
SYSTEM
104
48
106
106

FIG. 8

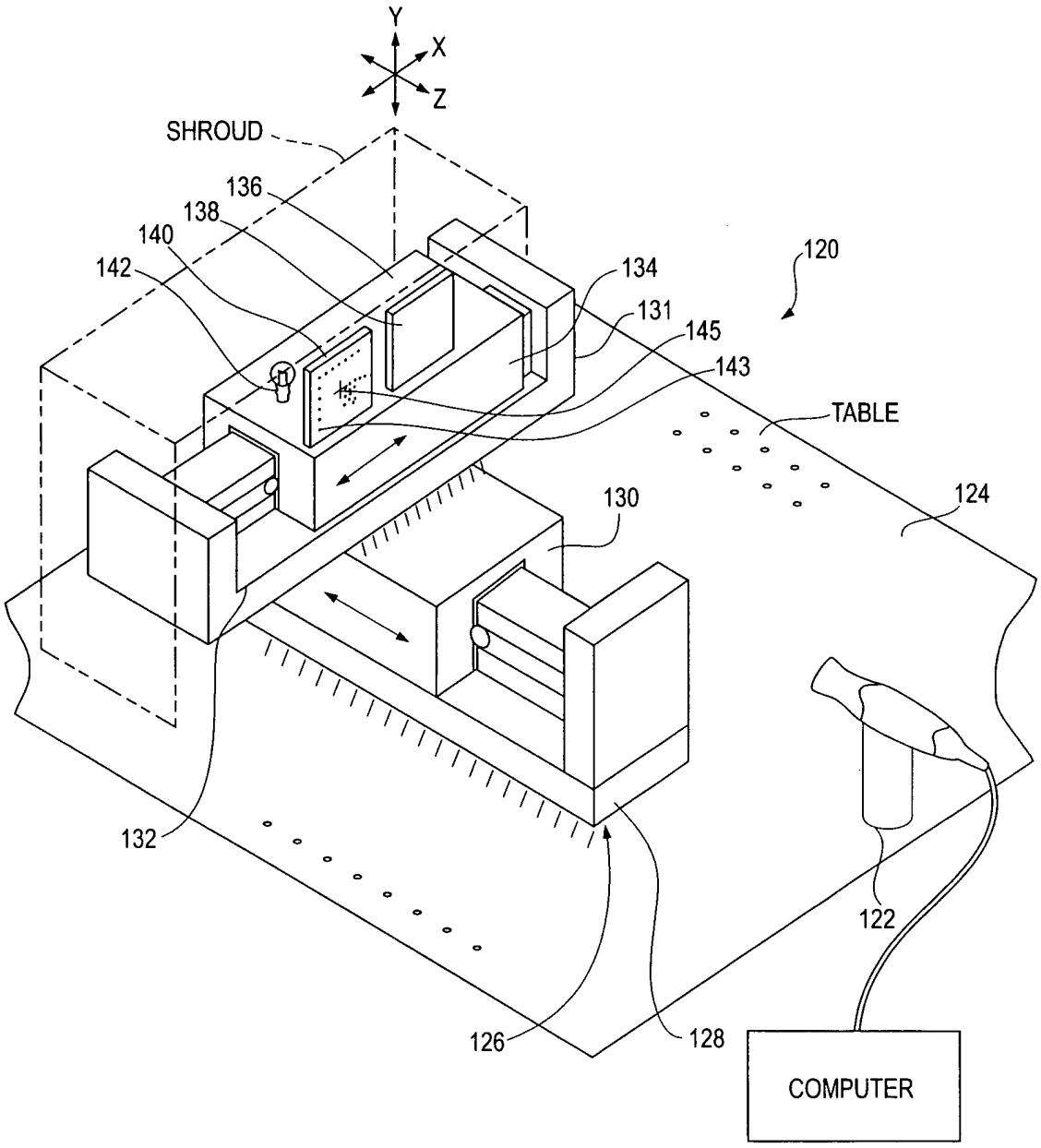

Y
X
Z
SHROUD
136
138
140
142
134
131
145
143
120
TABLE
130
124
132
122
126
128
COMPUTER

FIG. 8A

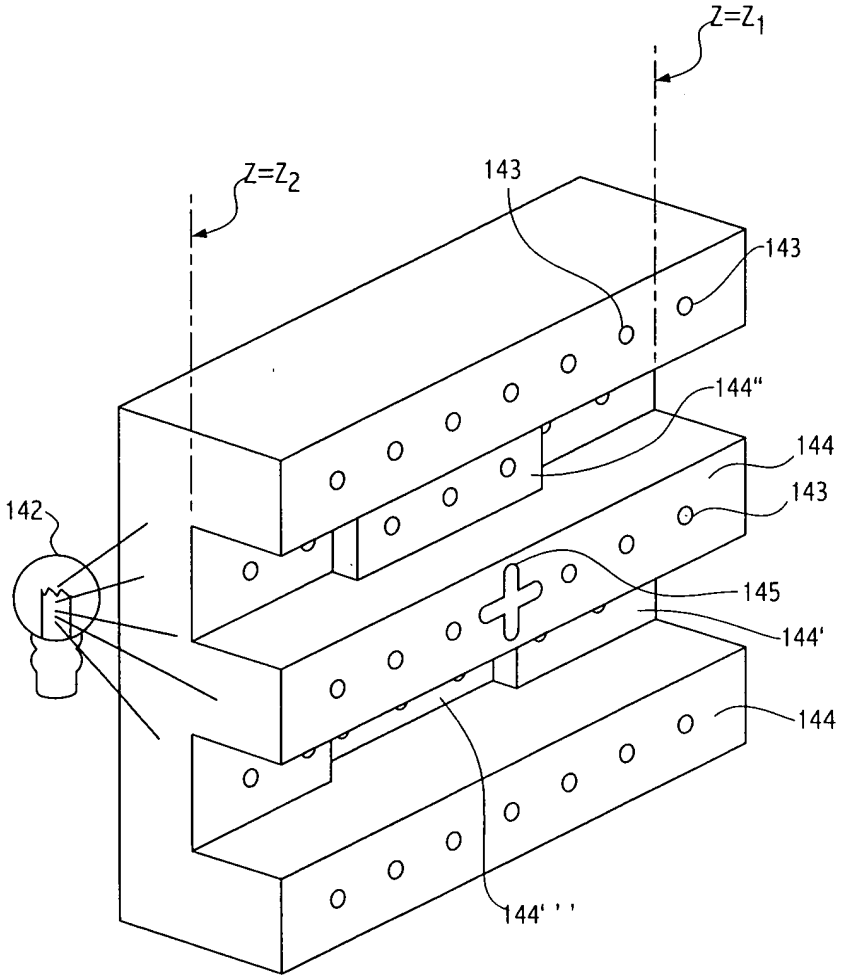


FIG. 9

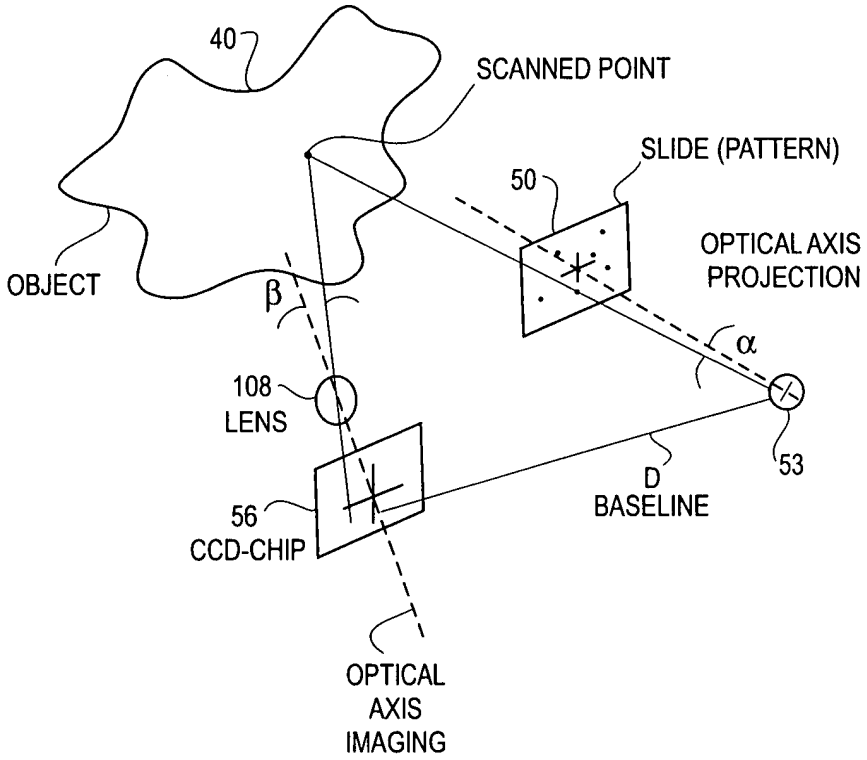

40
SCANNED POINT
SLIDE (PATTERN)
50
OPTICAL AXIS
PROJECTION
OBJECT
β
α
108
LENS
53
D
BASELINE
56
CCD-CHIP
OPTICAL
AXIS
IMAGING

FIG. 9A

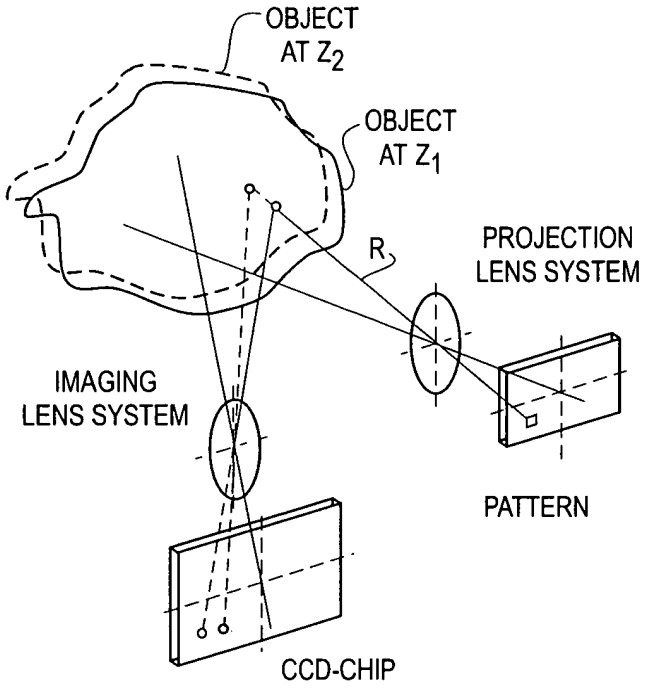


FIG. 9B

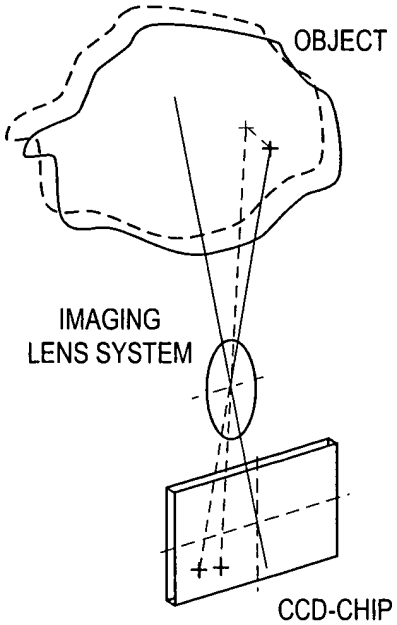
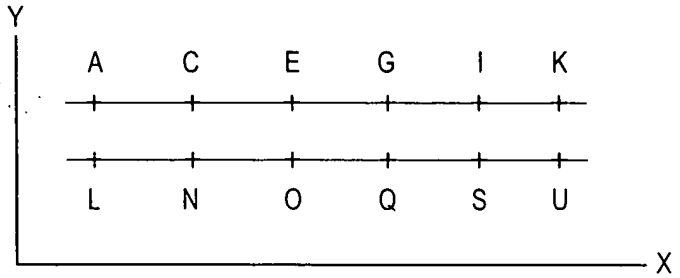


FIG. 9C



PIXEL COORDINATES FOR PORTIONS OF THE PATTERN ASSIGNED TO A CERTAIN Z-LEVEL

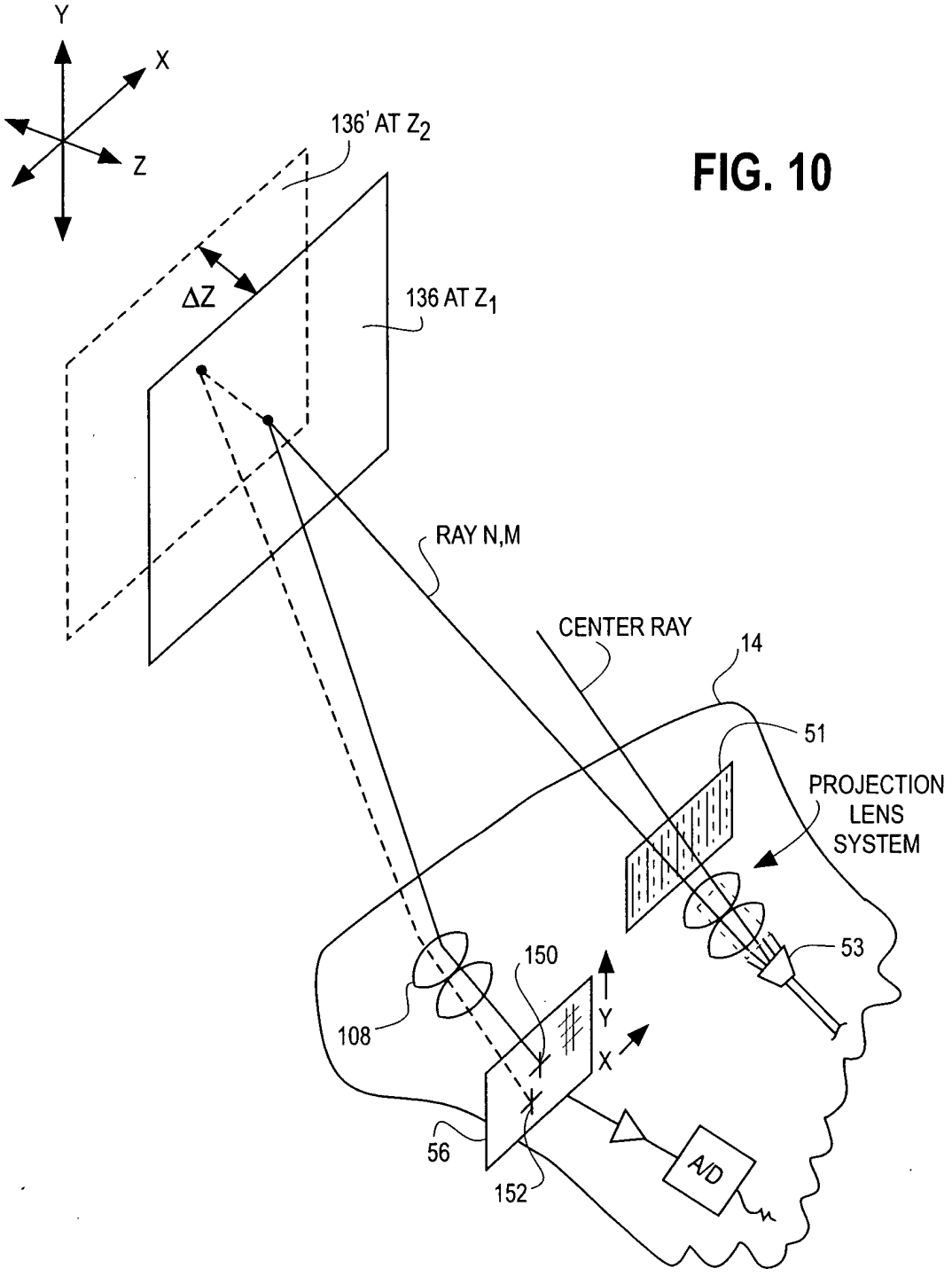

Y
X
Z
136' AT Z_2
ΔZ
136 AT Z_1
RAY N,M
CENTER RAY
14
51
PROJECTION
LENS
SYSTEM
53
150
108
Y
X
56
152
A/D

FIG. 10

FIG. 11

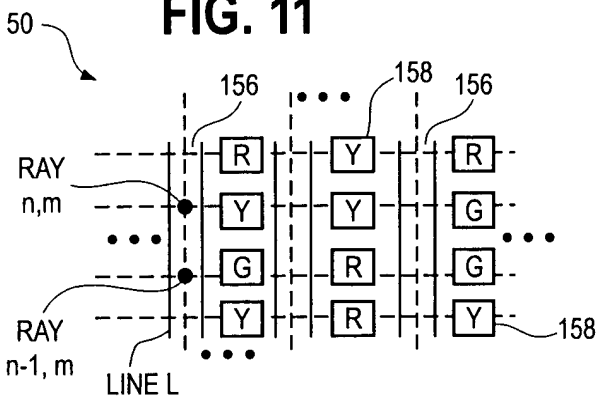


FIG. 12

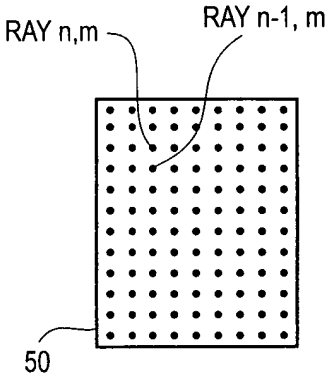


FIG. 13

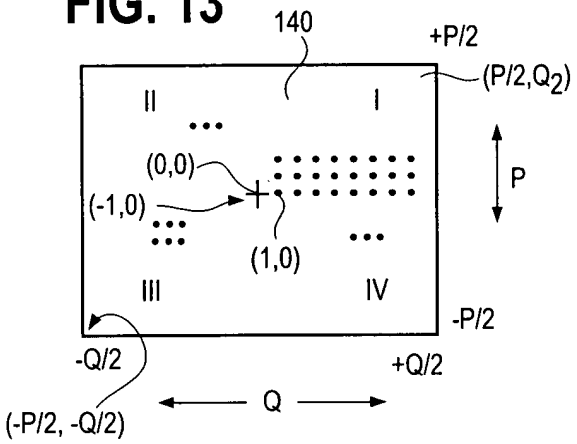


FIG. 14

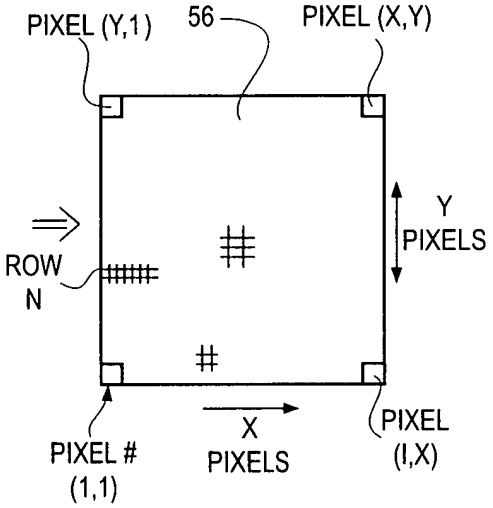


FIG. 15

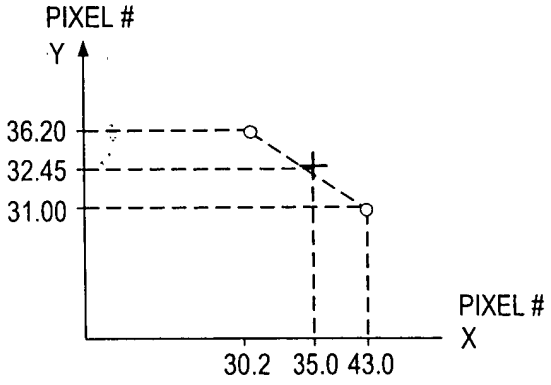


FIG. 16

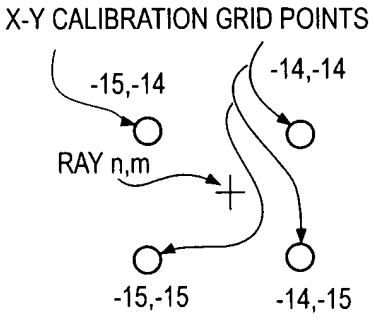


FIG. 17

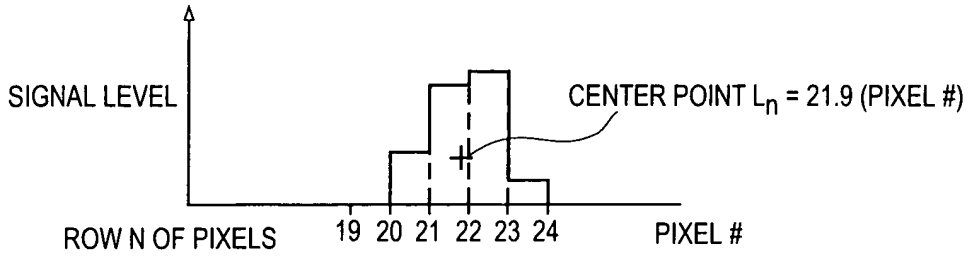


FIG. 18

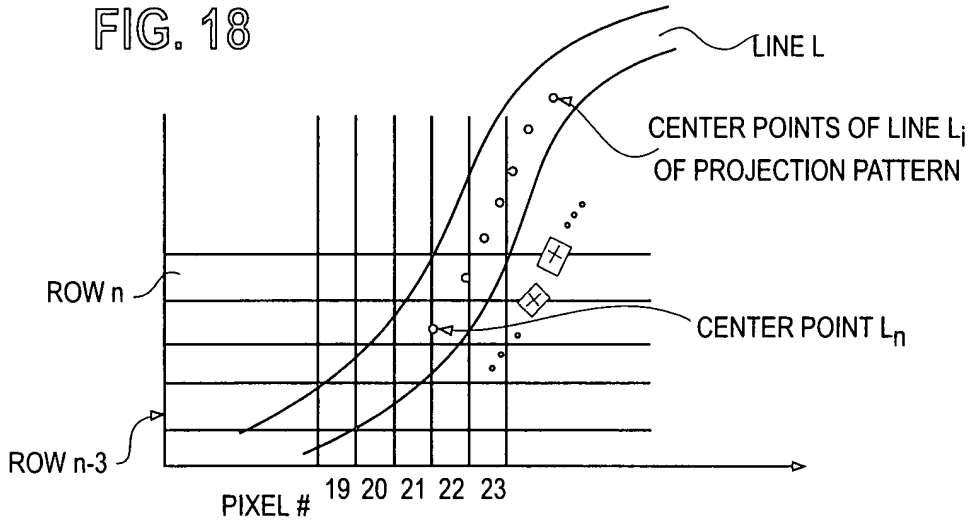


FIG. 19

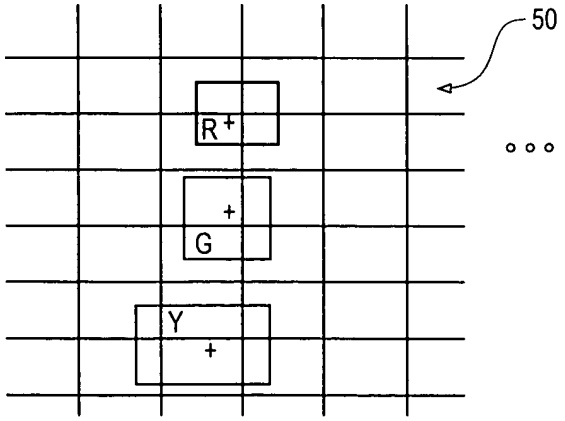


FIG. 20

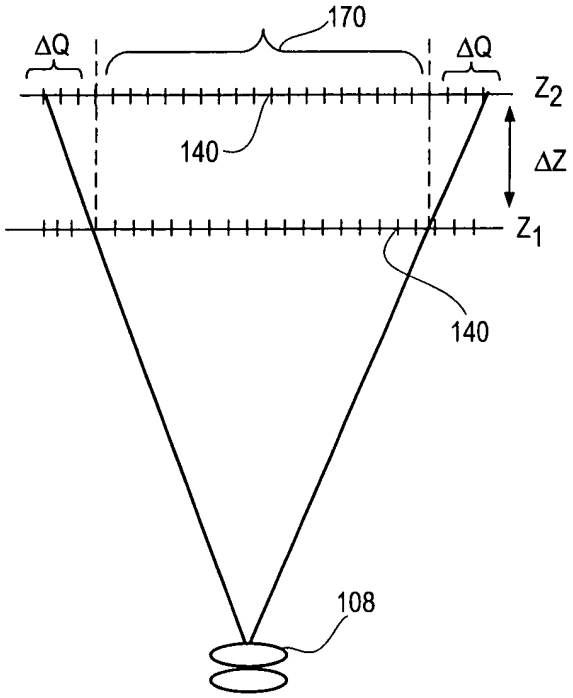

170
ΔQ
ΔQ
Z2
140
ΔZ
Z1
140
108

FIG. 21

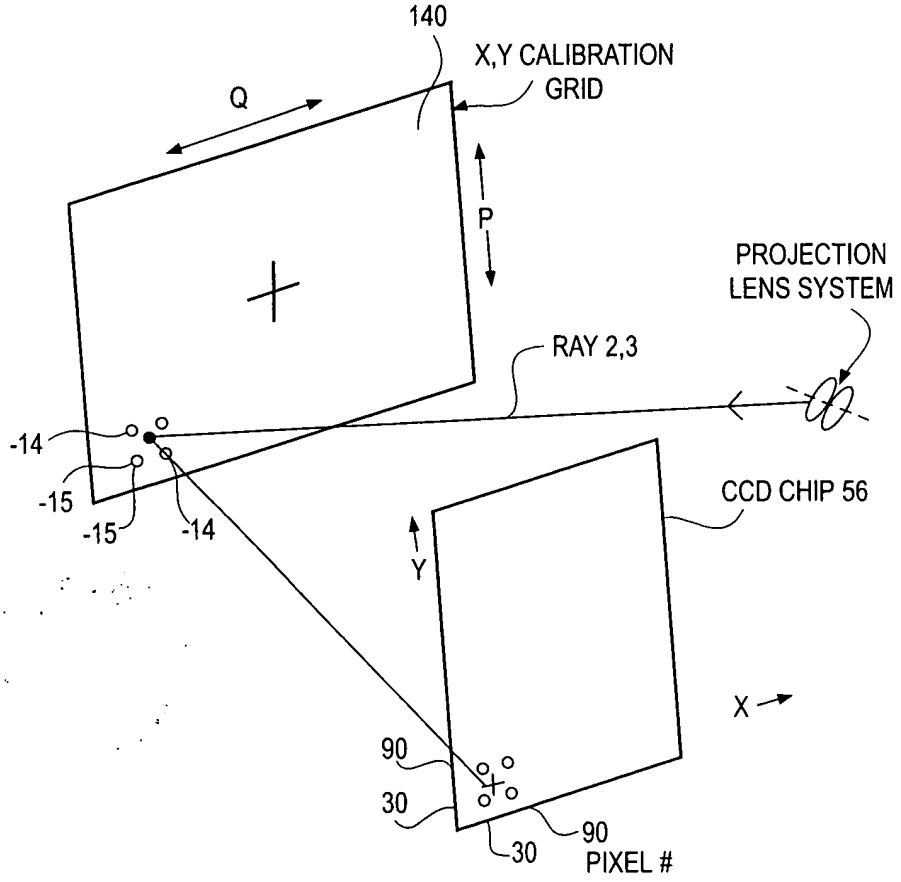

140
X,Y CALIBRATION
GRID
Q
P
PROJECTION
LENS SYSTEM
RAY 2,3
-14
-15
-15
-14
CCD CHIP 56
Y
X
90
30
90
30
PIXEL #

FIG. 22

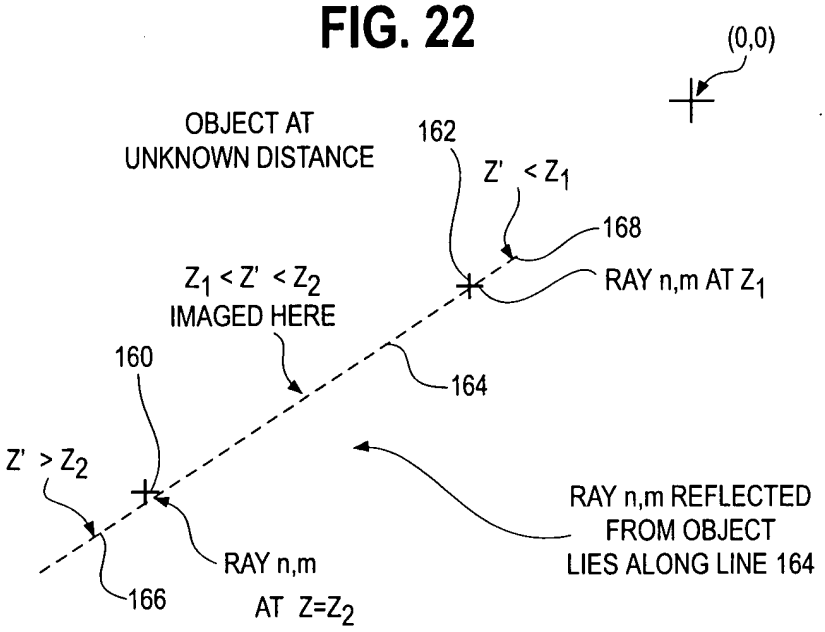

(0,0)
OBJECT AT
UNKNOWN DISTANCE
162
Z' < Z1
168
Z1 < Z' < Z2
IMAGED HERE
RAY n,m AT Z1
160
164
Z' > Z2
RAY n,m REFLECTED
FROM OBJECT
LIES ALONG LINE 164
RAY n,m
AT Z=Z2
166

FIG. 23

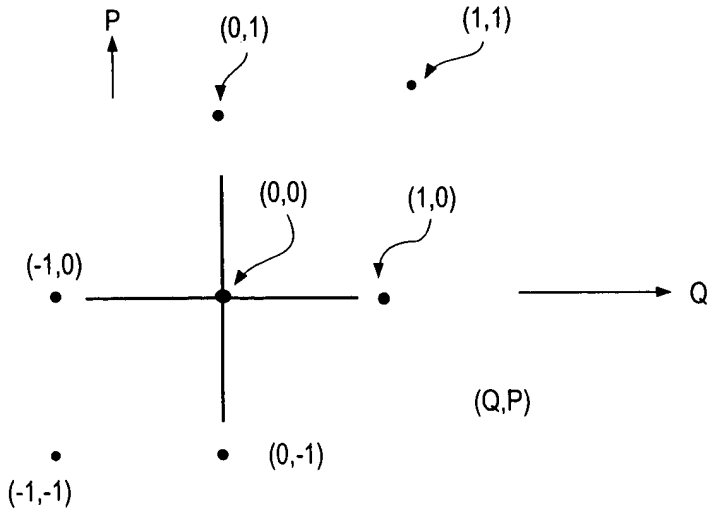

P
(0,1)
(1,1)
(0,0)
(1,0)
(-1,0)
Q
(Q,P)
(0,-1)
(-1,-1)

FIG. 24

CCD_X, CCD_Y = PIXEL #, IN SUBPIXEL RESOLUTION

(BEFORE)

CALIBRATION TABLE #1

		LINE 1						LINE 2						LINE N			
		ROW 1	ROW 2	ROW 3	ROW 4	∘ ∘ ∘	ROW M	ROW 1	ROW 2	ROW 3	ROW 4	∘ ∘ ∘	ROW M	ROW 1	ROW 2	∘ ∘ ∘	ROW M
Z_1	CCD_X	1.0	1.1	1.5	2.1		∘ ∘ ∘	27.1	29.5	30.2	37.1						
	MM DIST.																
	CCD_Y	10.2	20.4	32.8	44.5			11.5	21.6	36.2	44						
	MM DIST.																
Z_2	CCD_X	3.9	4.5	6.8	12.2			34.0	41.1	43.0	46						
	MM DIST.																
	CCD_Y	12.1	21.5	30.4	46.3			13.2	21.8	31.0	48.2						
	MM DIST.																

Scanning System & Calibration Method for Capturing Precise Three-Dimensional Information of Objects
Inventor: Rudger Rubbert
MBHB 01-099 09/834,593

CALIBRATION TABLE #2

(Q,P)

FIG. 25

QUADRANT I

		ROW 0								ROW 1					ROW + P/2			
		(0,0)	(1,0)	(2,0)	(3,0)	∘ ∘ ∘	(Q/2 - ΔQ,0)	∘ ∘ ∘	(Q/210)	(0,1)	(1,1)	(2,1)	∘ ∘ ∘	∘ ∘ ∘	(0, P/2)	(1, P/2)	∘ ∘ ∘	(Q/2, P/2)
Z_1	CCD_X	640.1	700.2	760.6	820.5	∘ ∘ ∘	∘ ∘ ∘		—	640.1	700.2	∘ ∘ ∘			∘ ∘ ∘	∘ ∘ ∘		1,279.5
	CCD_Y	640.1	640.1	640.3	640.4		∘ ∘ ∘		—	701.2	701.5	∘ ∘ ∘			∘ ∘ ∘	∘ ∘ ∘		1,279.4
Z_2	CCD_X	640.2	680.3	741.2	801.6		∘ ∘ ∘		1,279.5	∘ ∘ ∘	681.2	∘ ∘ ∘			∘ ∘ ∘	∘ ∘ ∘		1,256.4
	CCD_Y	640.2	640.3	640.1	640.1		∘ ∘ ∘		640.2	∘ ∘ ∘	680.9	∘ ∘ ∘			∘ ∘ ∘	∘ ∘ ∘		1,251.5

QUADRANT II

		ROW								ROW 1					ROW +P/2			
		(-1,0)	(-2,0)	(-3,0)	(-4, 0)	∘ ∘ ∘	(-Q/2 - ΔQ,0)	∘ ∘ ∘	(-Q/210)	(-1,1)	(-2,1)	(-3,1)	∘ ∘ ∘	∘ ∘ ∘	(-1, P/2)	(-2, P/2)	∘ ∘ ∘	(-Q/2, P/2)
Z_1	CCD_X																	
	CCD_Y																	
Z_2	CCD_X																	
	CCD_Y																	

QUADRANT III

Z_1	CCD_X	(-1,-1)	(-2,-1)	∘ ∘ ∘
	CCD_Y	—	—	
Z_2	CCD_X	—	—	
	CCD_Y	—	—	

QUADRANT IV

Z_1	CCD_X	(0,-1)	(1,-1)	∘ ∘ ∘
	CCD_Y	—	—	
Z_2	CCD_X	—	—	
	CCD_Y	—	—	

Scanning System & Calibration Method for Capturing Precise Three-Dimensional Information of Objects
Inventor: Rudger Rubbert
MBHB 01-099 09/834,593

FIG. 26

CCD_X, CCD_Y = PIXEL #, IN SUBPIXEL RESOLUTION

CALIBRATION TABLE #1 (AFTER)

		PATTERN LINE 1						PATTERN LINE 2						LINE N			
		ROW 1	ROW 2	ROW 3	ROW 4	∘ ∘ ∘	ROW M	ROW 1	ROW 2	ROW 3	ROW 4	∘ ∘ ∘	ROW M	ROW 1	ROW 2	∘ ∘ ∘	ROW M
Z_1	CCD_X	1.0	1.1	1.5	2.1		∘ ∘ ∘	27.1	29.5	30.2	37.1						
	MM DIST.									-14.6							
	CCD_Y	10.2	20.4	32.8	44.5			11.5	21.6	36.2	44						
	MM DIST.									-14.4							
Z_2	CCD_X	3.9	4.5	6.8	12.2			34.0	41.1	43.0	46						
	MM DIST.									-14.8							
	CCD_Y	12.1	21.5	30.4	46.3			13.2	21.8	31.0	48.2						
	MM DIST.									-15.8							

Scanning System & Calibration Method for Capturing Precise Three-Dimensional Information of Objects
Inventor: Rudger Rubbert
MBHB 01-099 09/834,593

Fig. 27

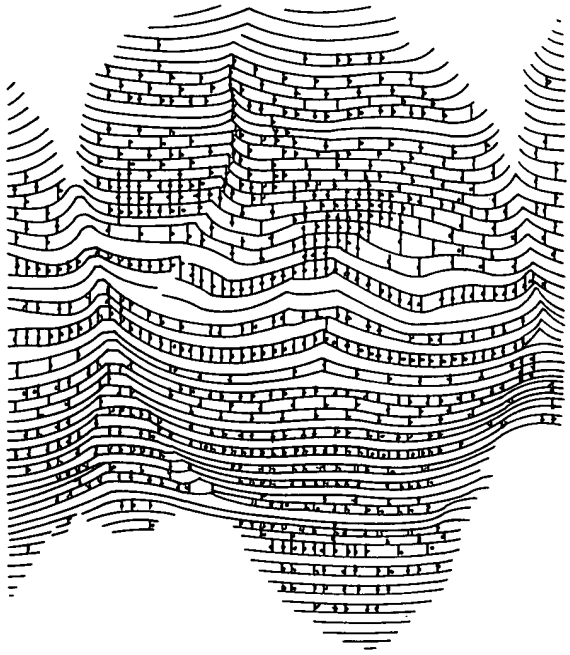


Fig. 28

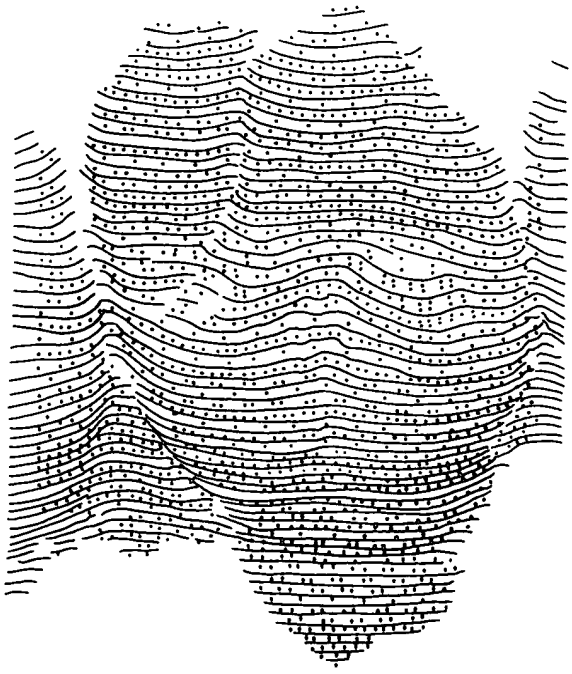


Fig. 29

Fig. 30

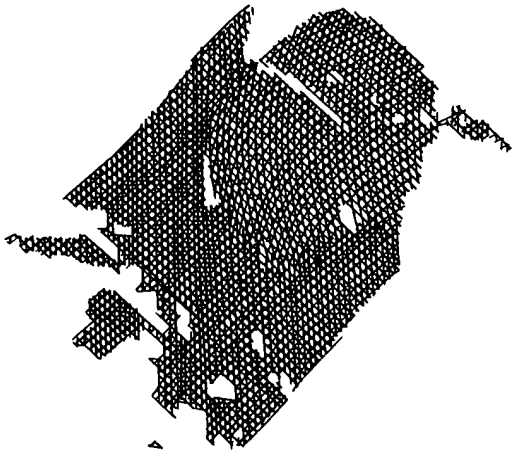


Fig. 31

Fig. 32

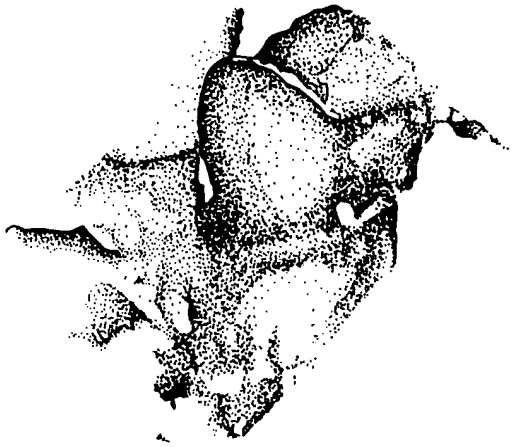


Fig. 33

Fig. 34

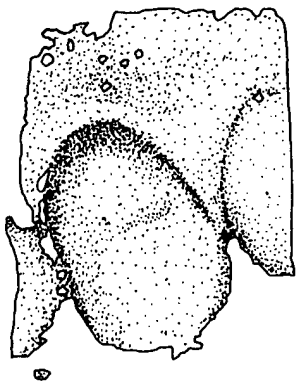


Fig. 35

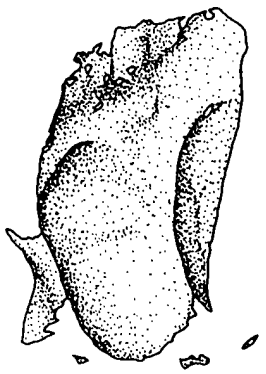
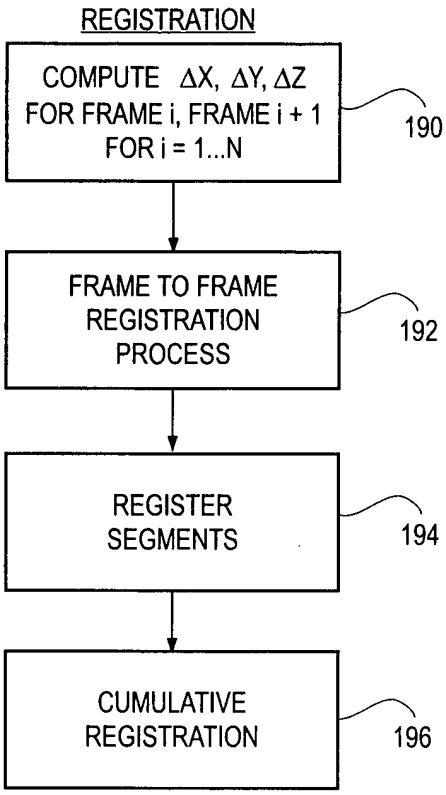


FIG. 36


REGISTRATION
COMPUTE ΔX, ΔY, ΔZ
FOR FRAME i, FRAME i + 1
FOR i = 1...N
190
FRAME TO FRAME
REGISTRATION
PROCESS
192
REGISTER
SEGMENTS
194
CUMULATIVE
REGISTRATION
196

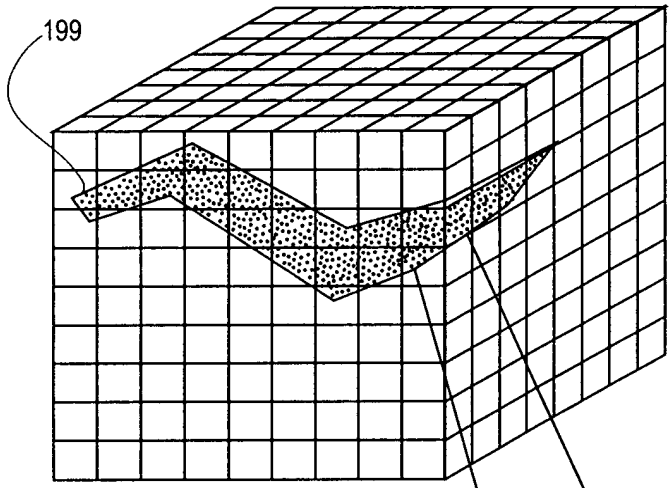


FIG. 37A

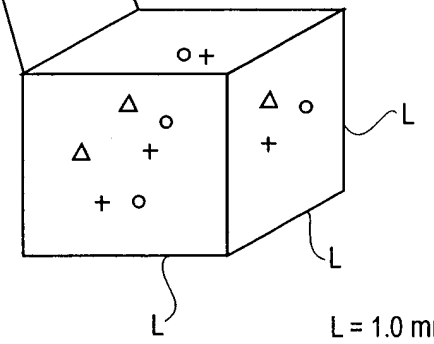


FIG. 37B

L = 1.0 mm

Δ = POINTS OF FRAME i
+ = POINTS OF FRAME i + 1
o = POINTS OF FRAME i + 2

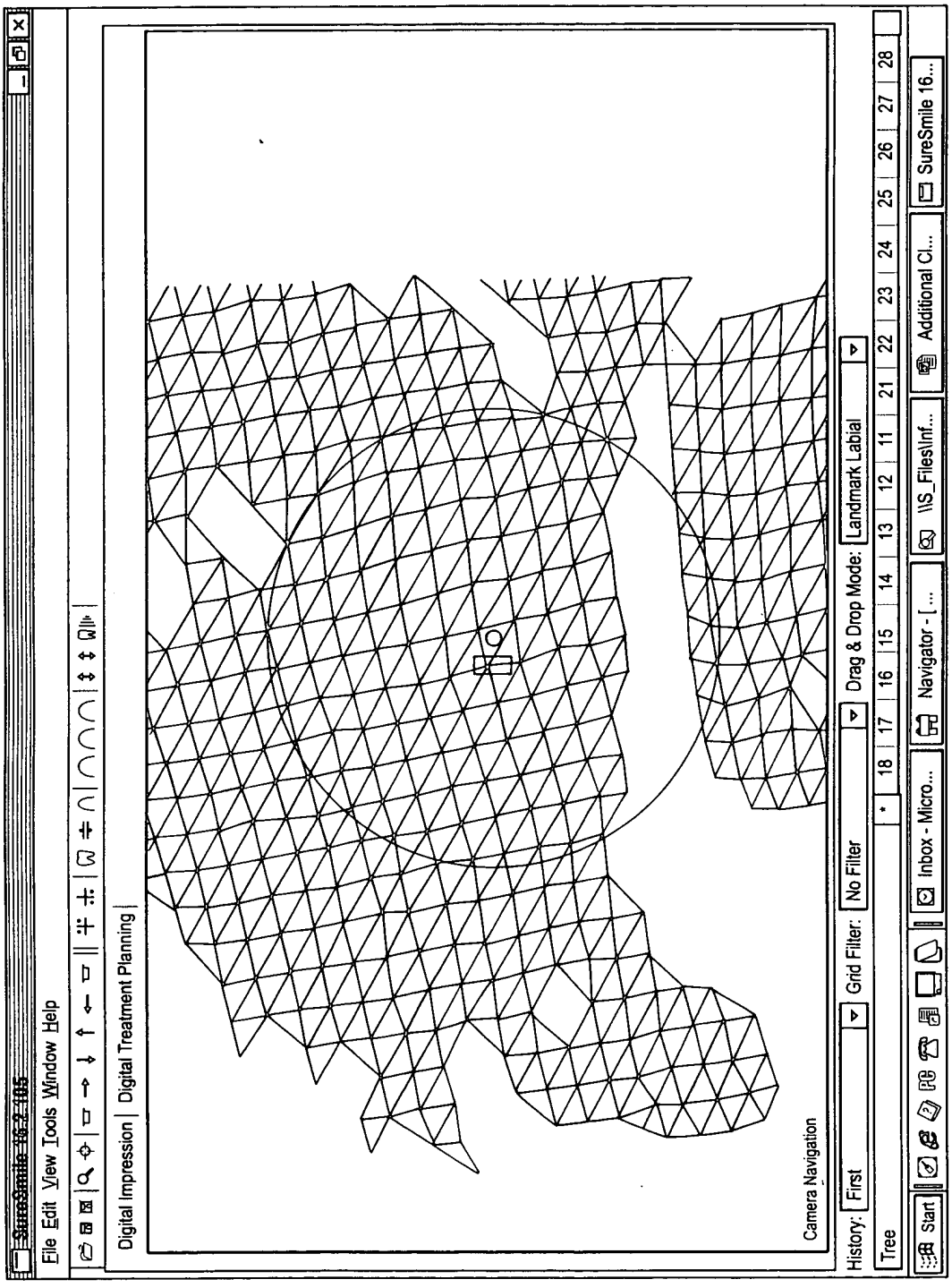

SureSmile 16.2.105
File Edit View Tools Window Help
Digital Impression
Digital Treatment Planning
Camera Navigation
History: First
Grid Filter: No Filter
Drag & Drop Mode: Landmark Labial
Tree
Start
Inbox - Micro...
Navigator - [...
\\S_Files\Inf...
Additional Cl...
SureSmile 16...

FIG. 37C

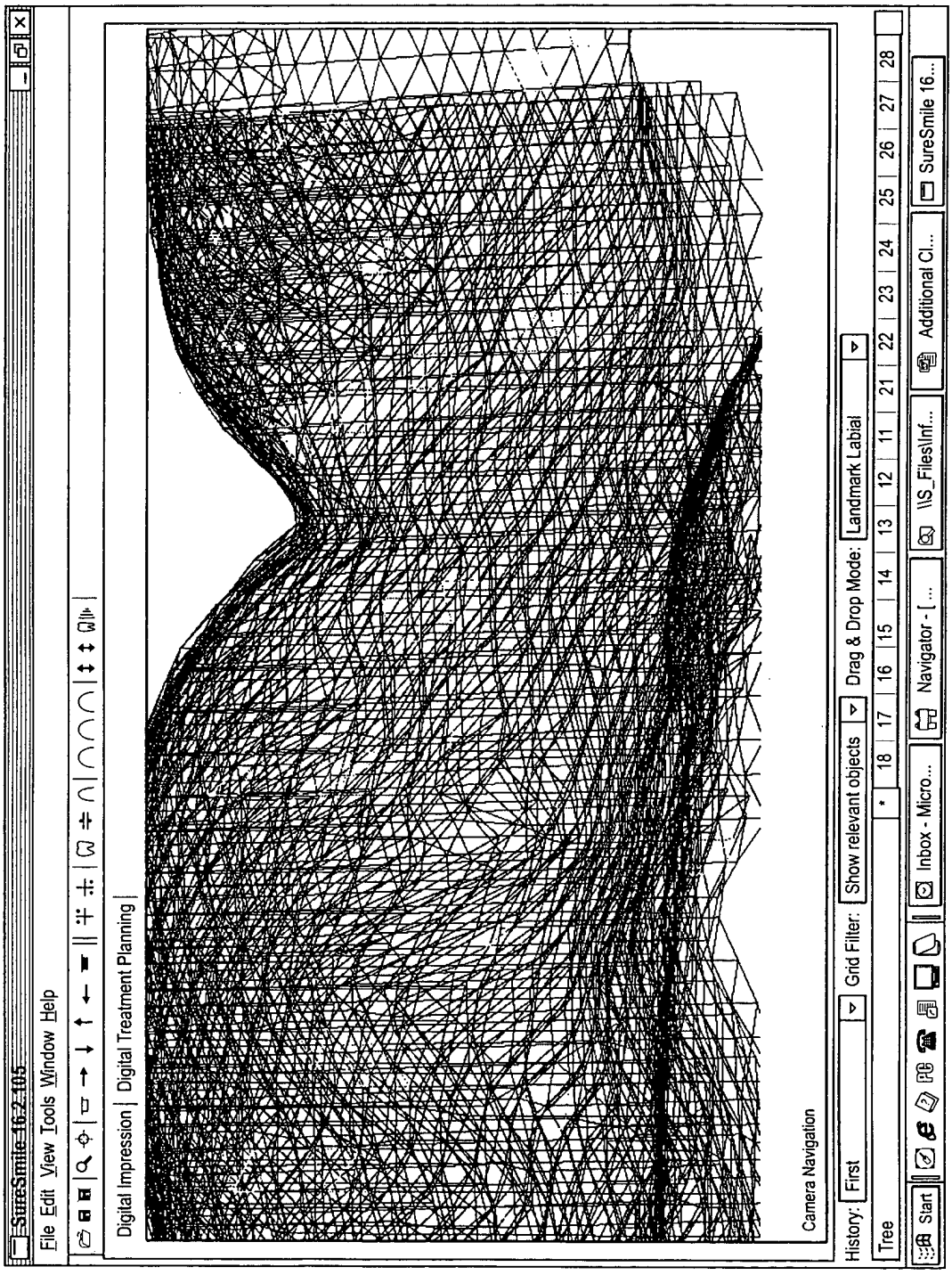

SureSmile 16.2.105
File Edit View Tools Window Help
Digital Impression
Digital Treatment Planning
Camera Navigation
History: First
Grid Filter: Show relevant objects
Drag & Drop Mode: Landmark Labial
Tree
Start
Inbox - Micro...
Navigator - [...
\\S_Files\Inf...
Additional Cl...
SureSmile 16...

FIG. 37D

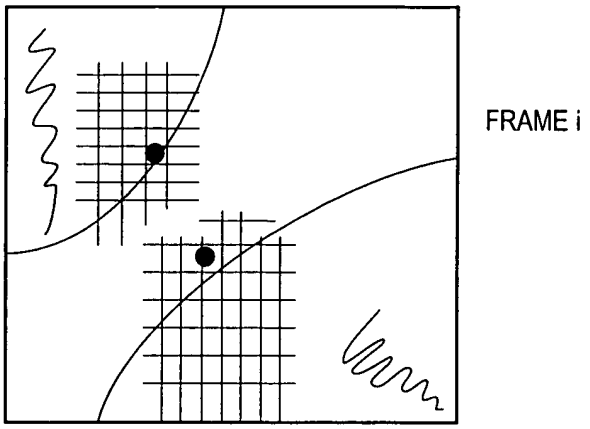


FIG. 38A

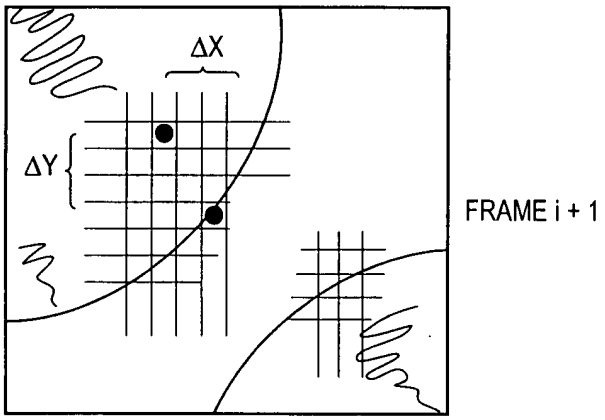


FIG. 38B

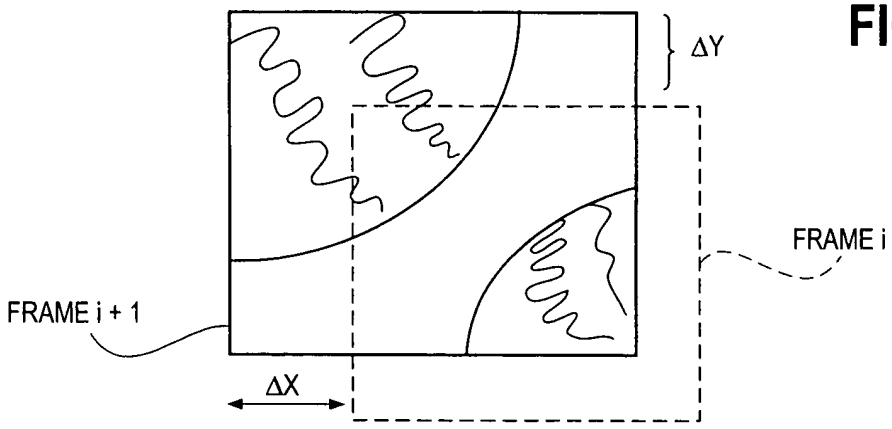


FIG. 38C

FIG. 39A

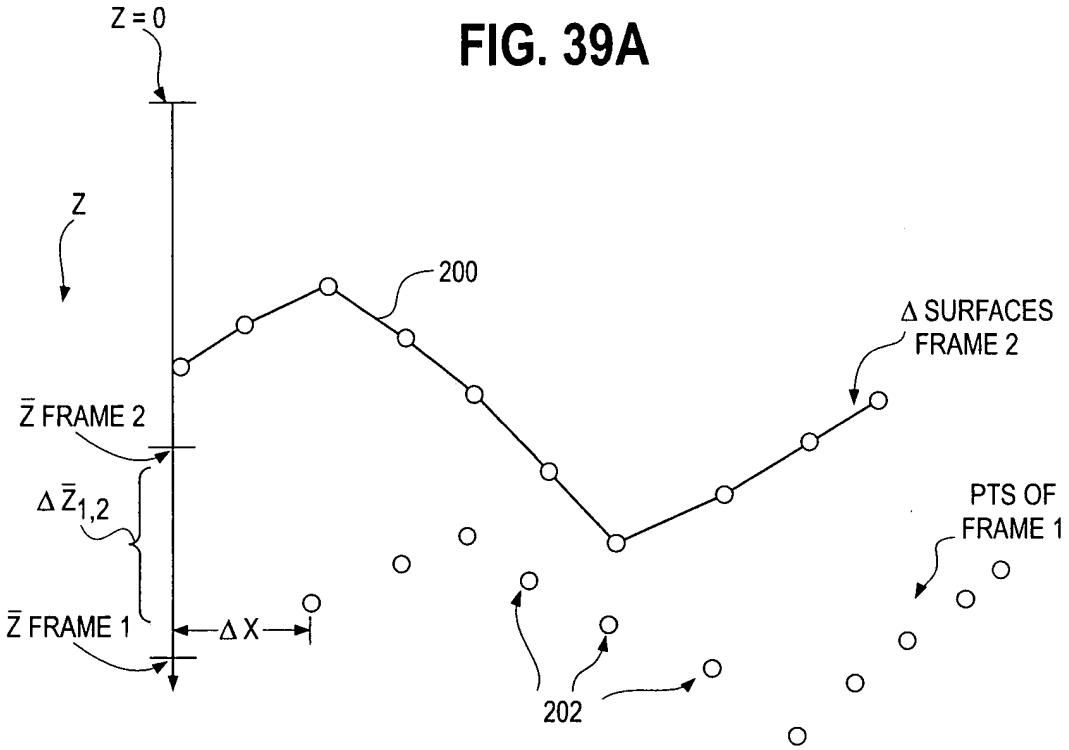


FIG. 39B

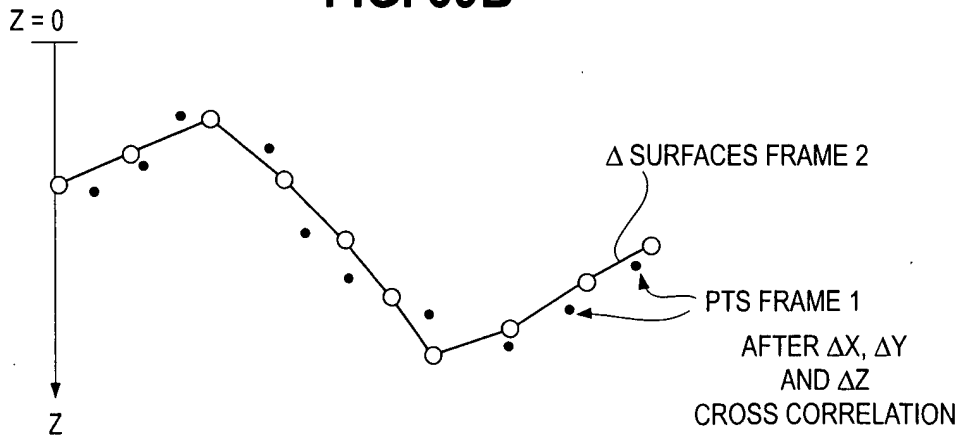


FIG. 40A

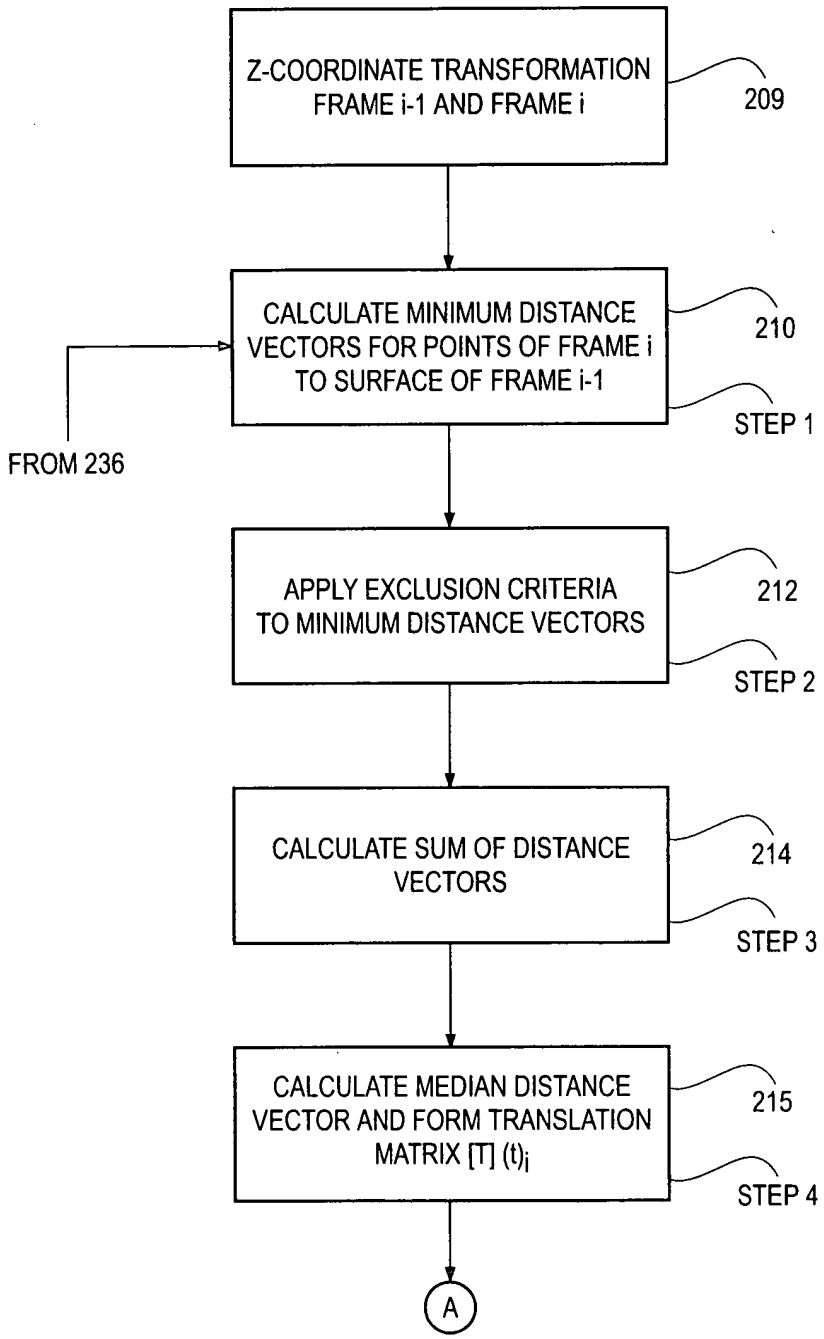

Z-COORDINATE TRANSFORMATION FRAME i-1 AND FRAME i
209
CALCULATE MINIMUM DISTANCE VECTORS FOR POINTS OF FRAME i TO SURFACE OF FRAME i-1
210
STEP 1
FROM 236
APPLY EXCLUSION CRITERIA TO MINIMUM DISTANCE VECTORS
212
STEP 2
CALCULATE SUM OF DISTANCE VECTORS
214
STEP 3
CALCULATE MEDIAN DISTANCE VECTOR AND FORM TRANSLATION MATRIX [T] (t)i
215
STEP 4
A

FIG. 40B

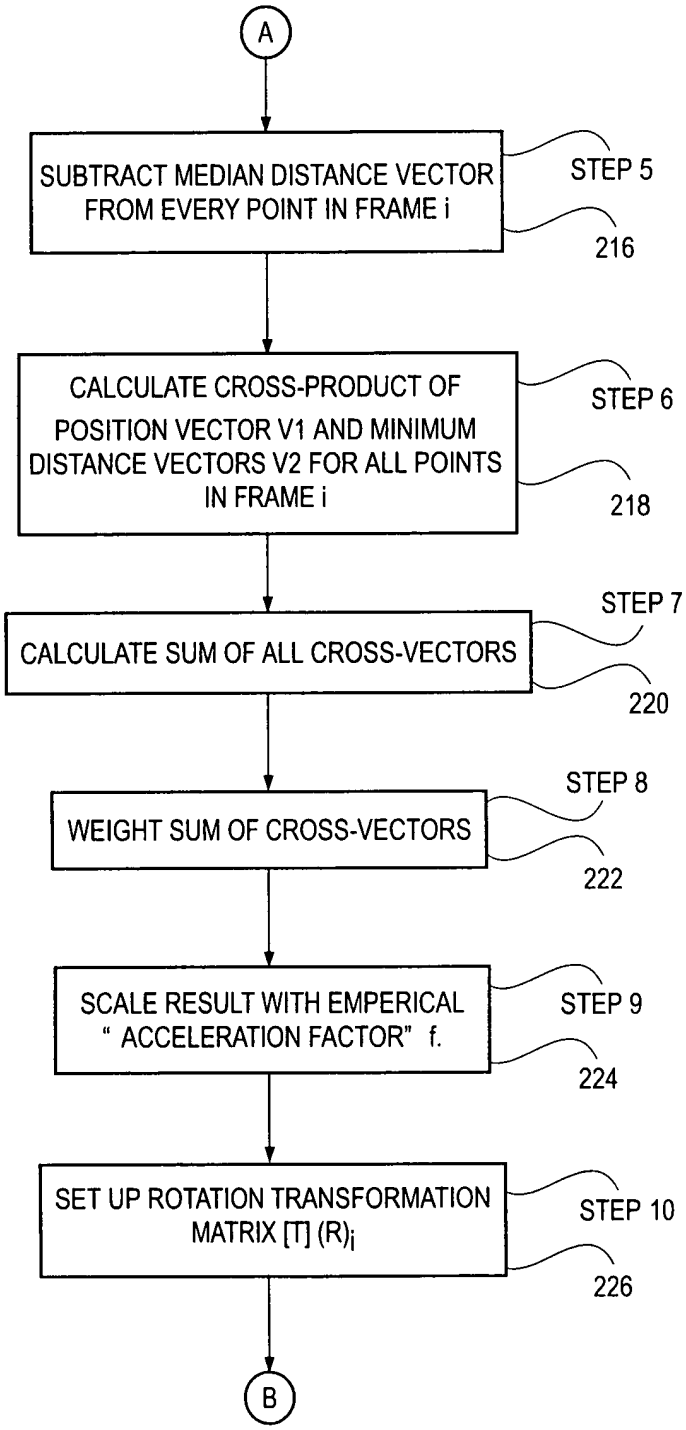

A
SUBTRACT MEDIAN DISTANCE VECTOR FROM EVERY POINT IN FRAME i
STEP 5
216
CALCULATE CROSS-PRODUCT OF POSITION VECTOR V1 AND MINIMUM DISTANCE VECTORS V2 FOR ALL POINTS IN FRAME i
STEP 6
218
CALCULATE SUM OF ALL CROSS-VECTORS
STEP 7
220
WEIGHT SUM OF CROSS-VECTORS
STEP 8
222
SCALE RESULT WITH EMPERICAL " ACCELERATION FACTOR" f.
STEP 9
224
SET UP ROTATION TRANSFORMATION MATRIX [T] (R)i
STEP 10
226
B

FIG. 40C

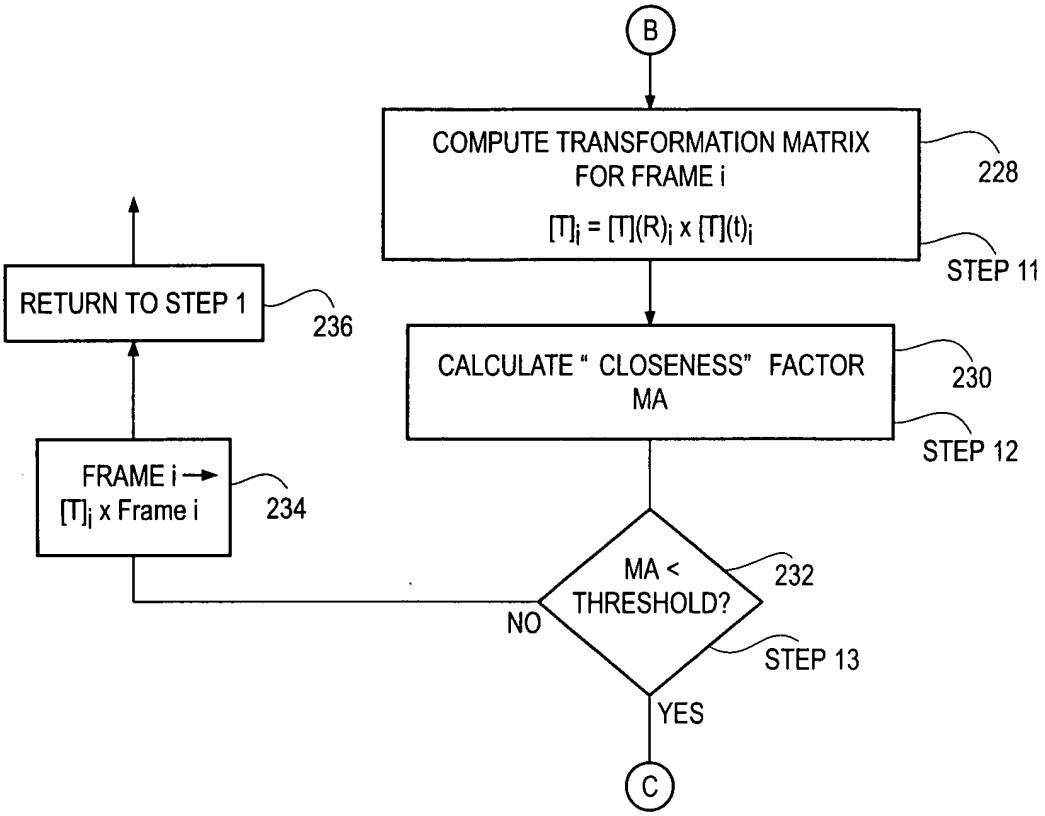

B
COMPUTE TRANSFORMATION MATRIX FOR FRAME i
$[T]_i = [T](R)_i \times [T](t)_i$
228
STEP 11
CALCULATE " CLOSENESS" FACTOR MA
230
STEP 12
MA < THRESHOLD?
232
STEP 13
NO
YES
RETURN TO STEP 1
236
FRAME i → $[T]_i$ x Frame i
234
C

FIG. 40D

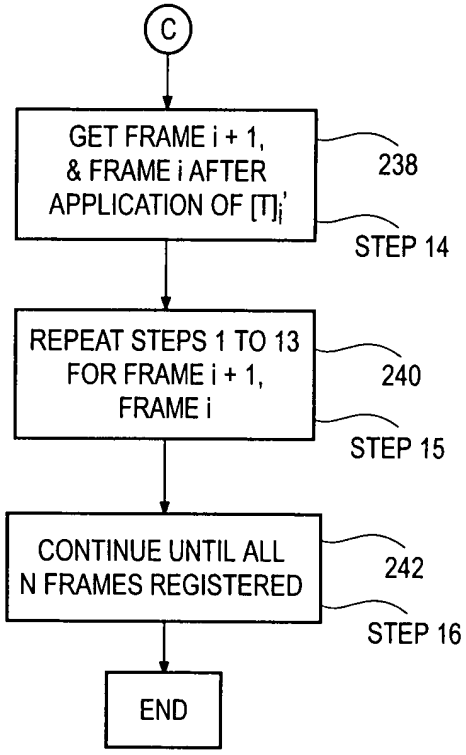

C
GET FRAME i + 1, & FRAME i AFTER APPLICATION OF [T]i'
238
STEP 14
REPEAT STEPS 1 TO 13 FOR FRAME i + 1, FRAME i
240
STEP 15
CONTINUE UNTIL ALL N FRAMES REGISTERED
242
STEP 16
END

FIG. 41

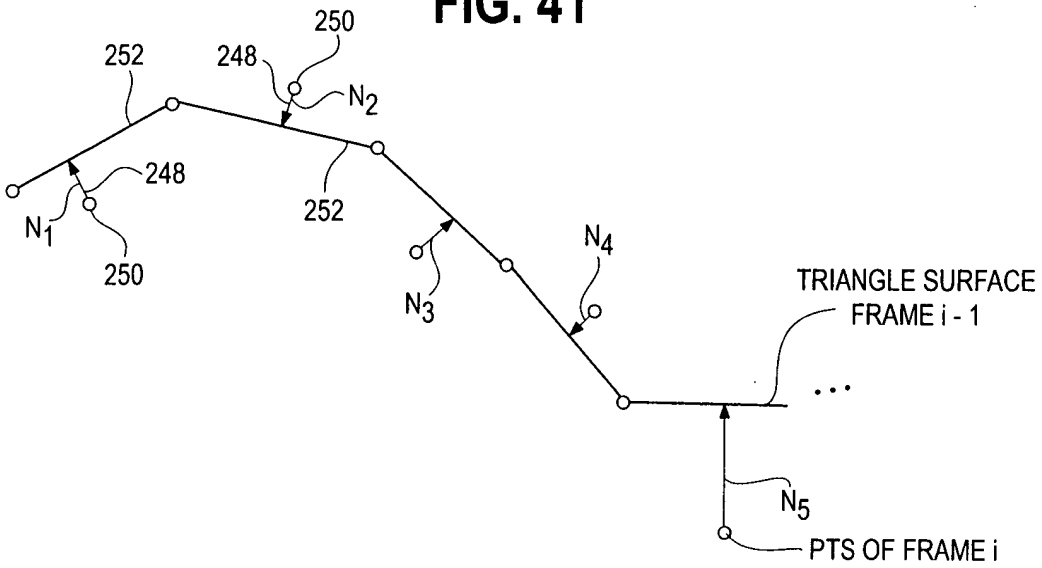


FIG. 42

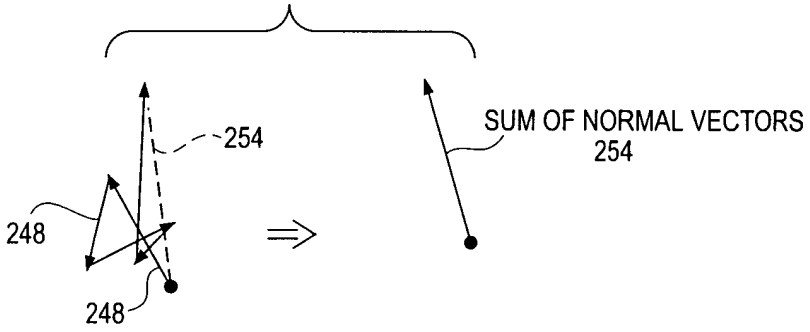


FIG. 43

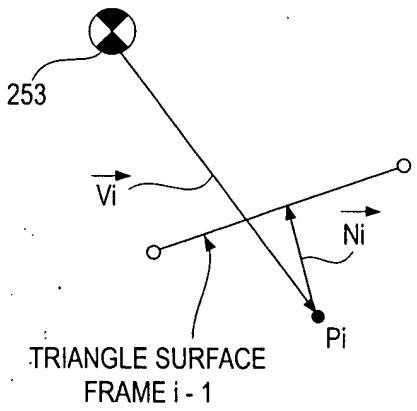


FIG. 44

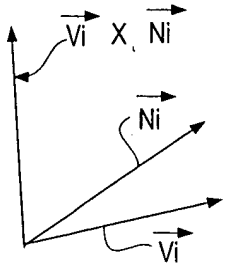


FIG. 45

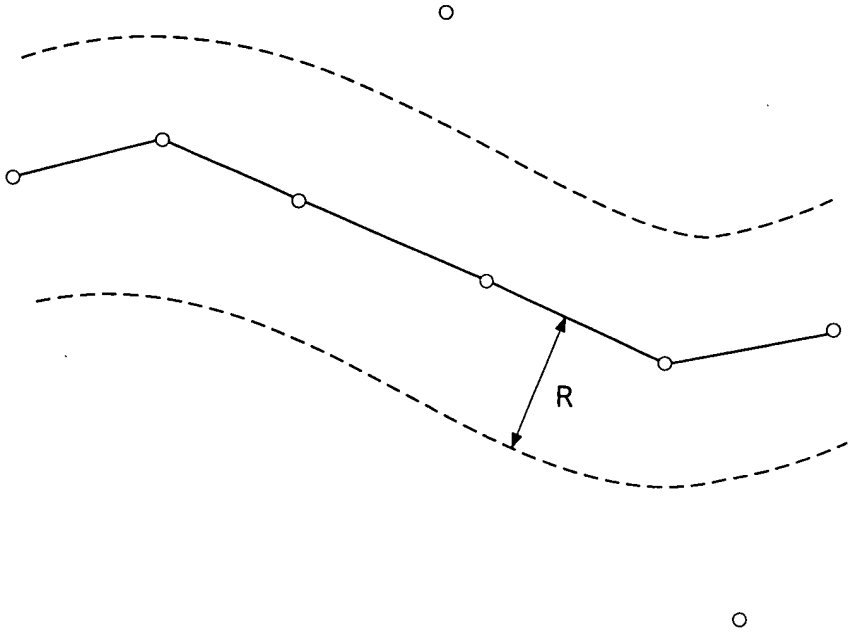

R

FIG. 46

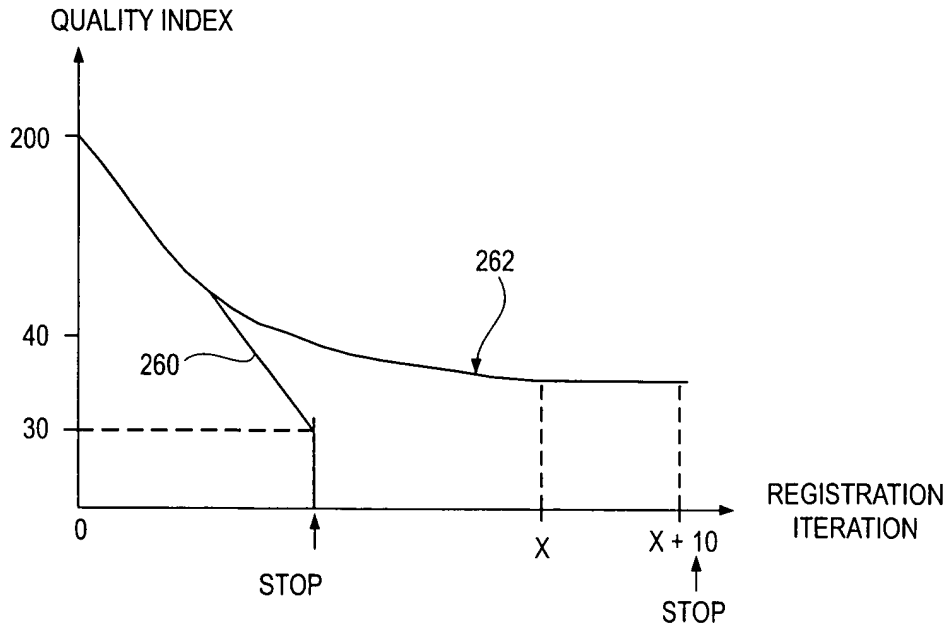

QUALITY INDEX
200
40
30
0
260
262
STOP
X
X + 10
STOP
REGISTRATION
ITERATION

FIG. 47A

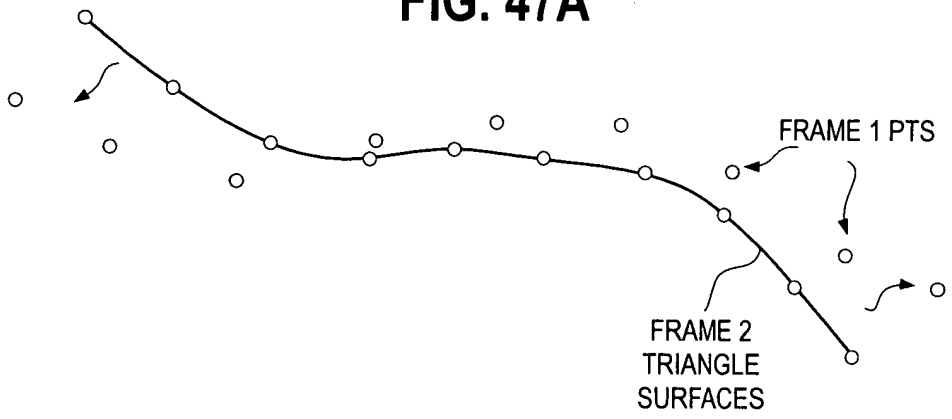


FIG. 47B

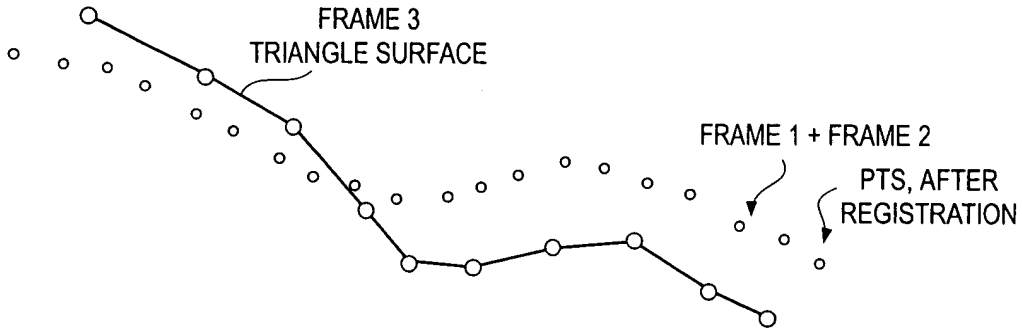


FIG. 48A

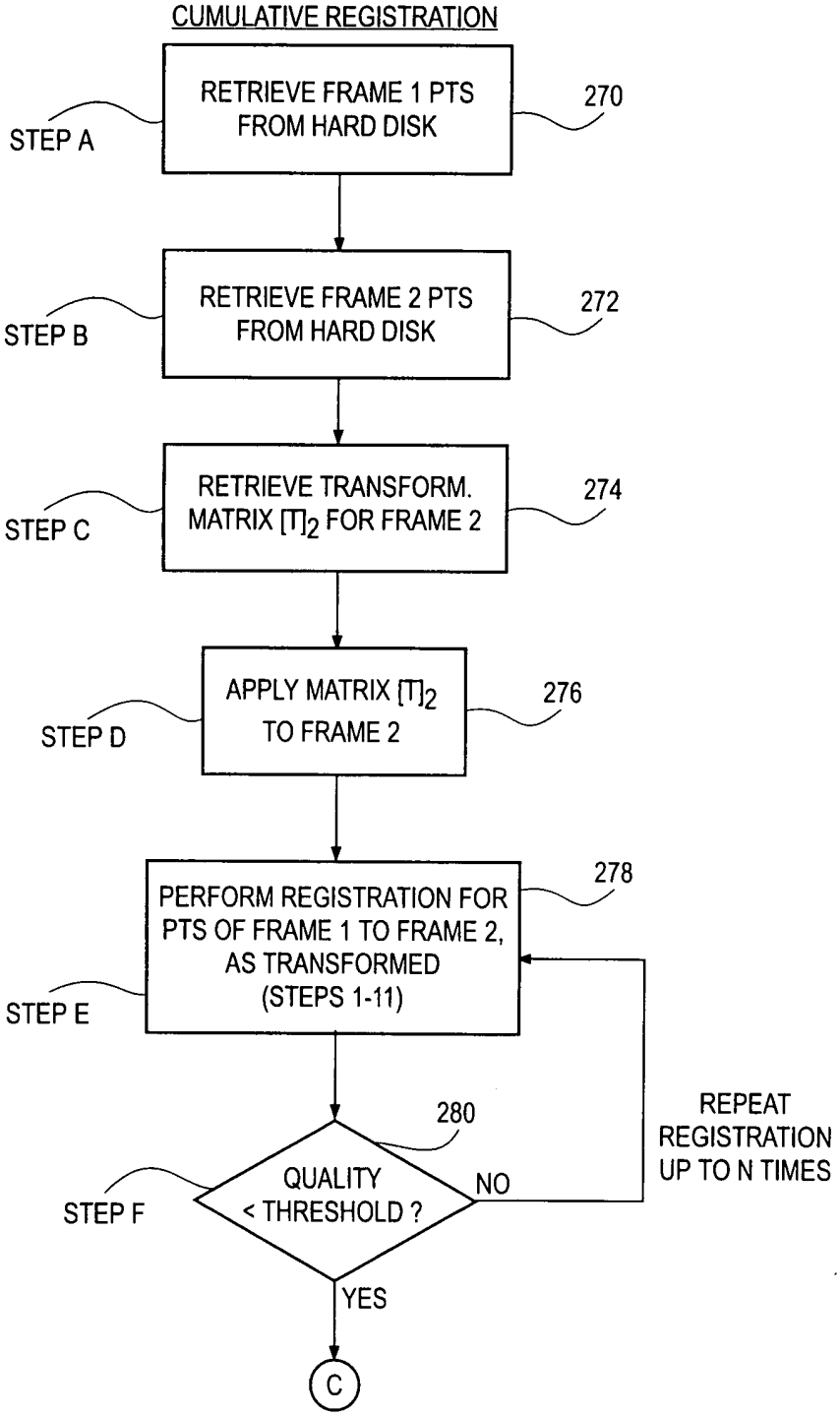

CUMULATIVE REGISTRATION
RETRIEVE FRAME 1 PTS FROM HARD DISK
STEP A
270
RETRIEVE FRAME 2 PTS FROM HARD DISK
STEP B
272
RETRIEVE TRANSFORM. MATRIX [T]2 FOR FRAME 2
STEP C
274
APPLY MATRIX [T]2 TO FRAME 2
STEP D
276
PERFORM REGISTRATION FOR PTS OF FRAME 1 TO FRAME 2, AS TRANSFORMED (STEPS 1-11)
STEP E
278
280
QUALITY < THRESHOLD ?
STEP F
NO
REPEAT REGISTRATION UP TO N TIMES
YES
C

FIG. 48B

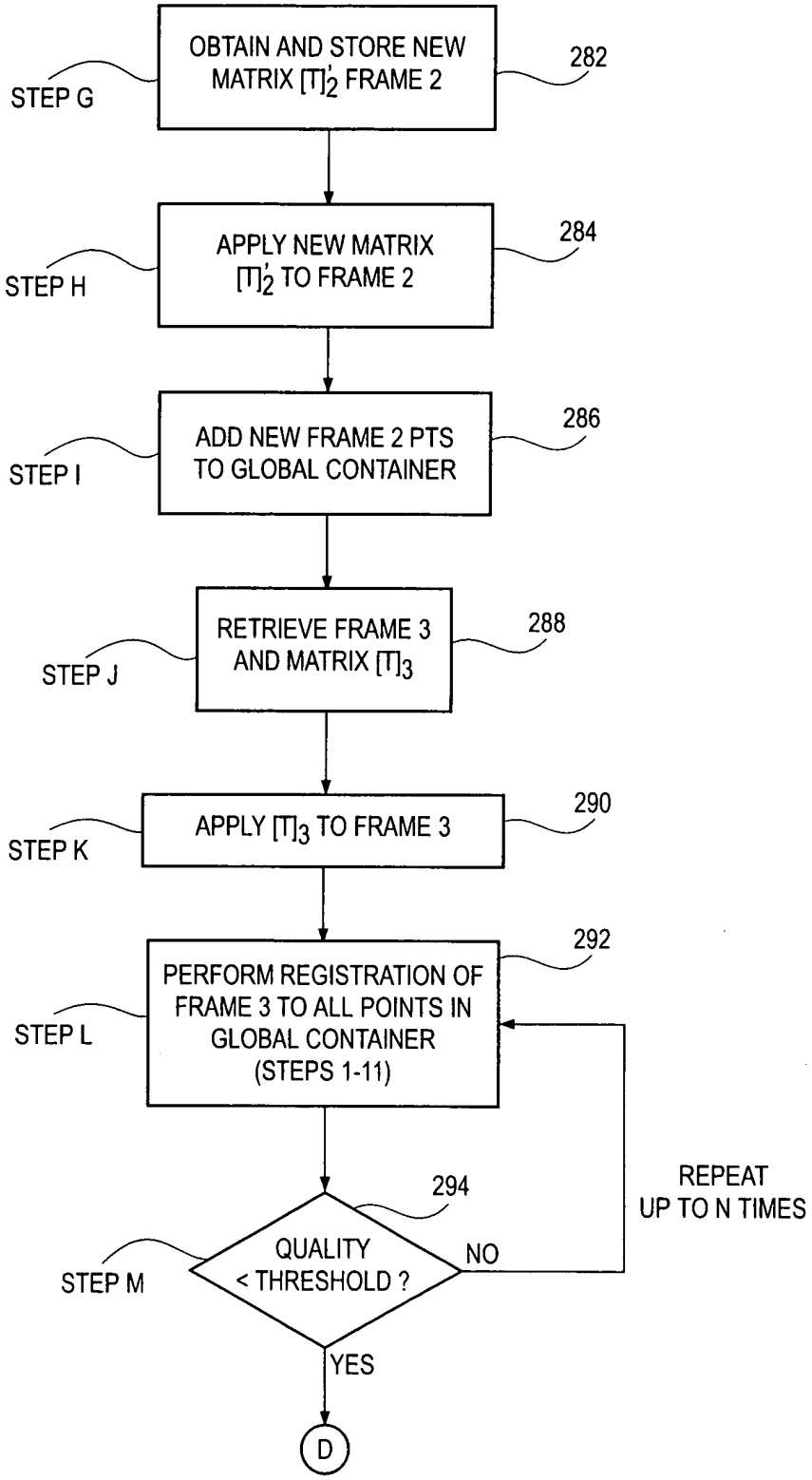

STEP G
OBTAIN AND STORE NEW MATRIX $[T]_2'$ FRAME 2
282
STEP H
APPLY NEW MATRIX $[T]_2'$ TO FRAME 2
284
STEP I
ADD NEW FRAME 2 PTS TO GLOBAL CONTAINER
286
STEP J
RETRIEVE FRAME 3 AND MATRIX $[T]_3$
288
STEP K
APPLY $[T]_3$ TO FRAME 3
290
STEP L
PERFORM REGISTRATION OF FRAME 3 TO ALL POINTS IN GLOBAL CONTAINER (STEPS 1-11)
292
STEP M
QUALITY < THRESHOLD ?
294
NO
REPEAT UP TO N TIMES
YES
D

FIG. 48C

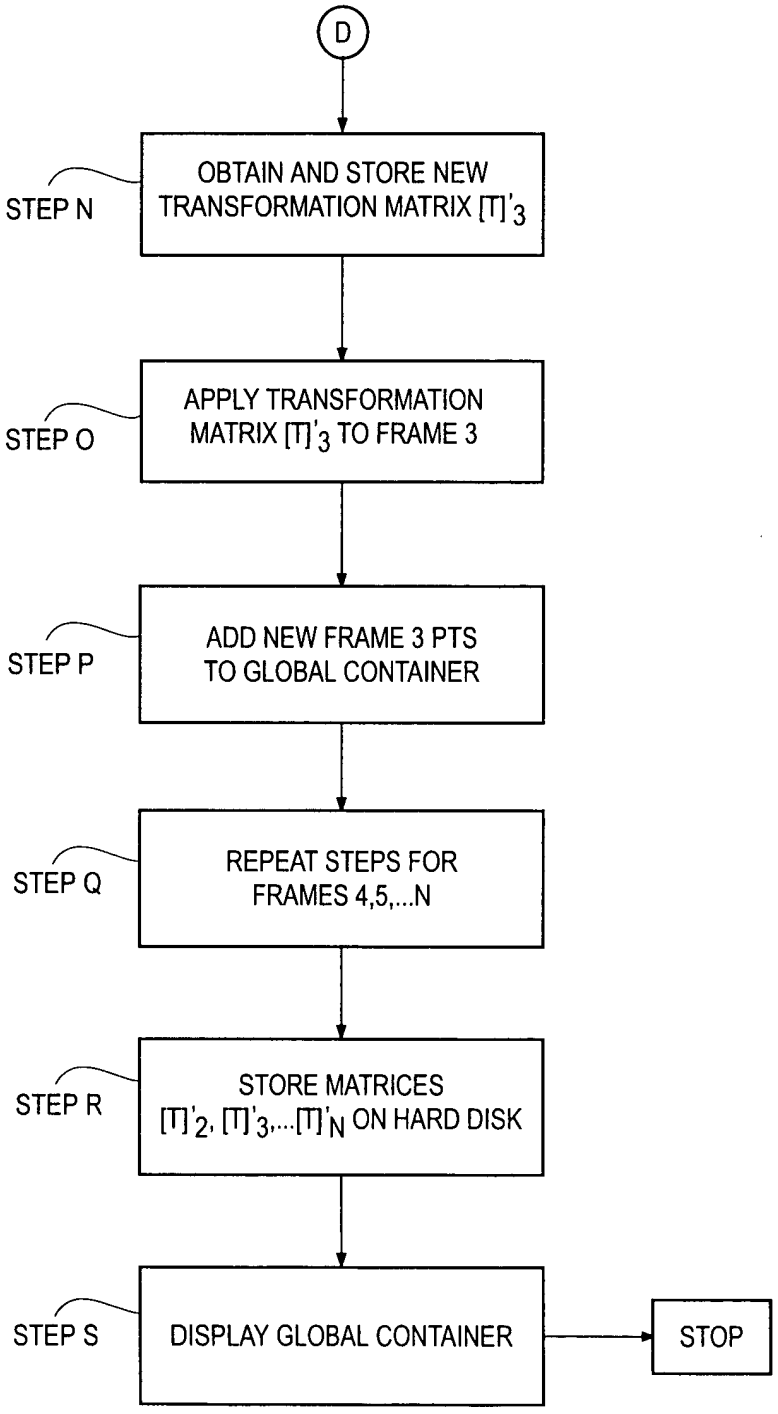

D
STEP N
OBTAIN AND STORE NEW TRANSFORMATION MATRIX [T]'3
STEP O
APPLY TRANSFORMATION MATRIX [T]'3 TO FRAME 3
STEP P
ADD NEW FRAME 3 PTS TO GLOBAL CONTAINER
STEP Q
REPEAT STEPS FOR FRAMES 4,5,...N
STEP R
STORE MATRICES [T]'2, [T]'3,...[T]'N ON HARD DISK
STEP S
DISPLAY GLOBAL CONTAINER
STOP

FIG. 49

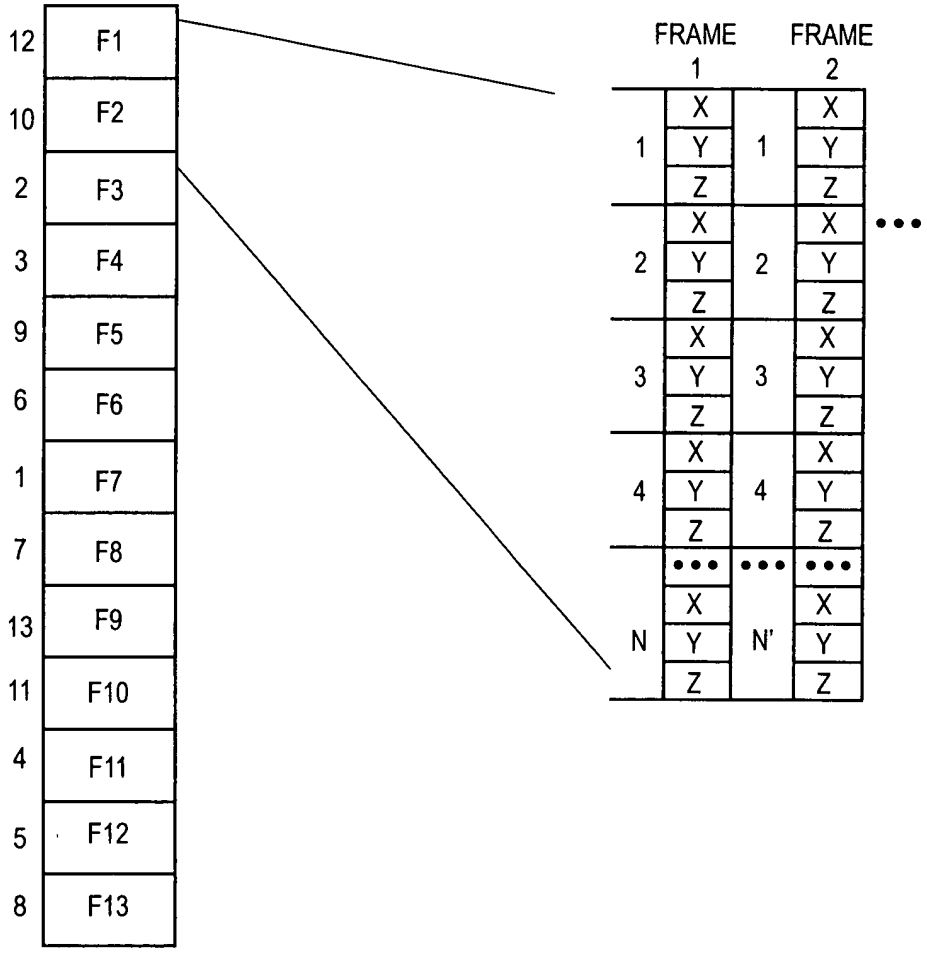

12 F1
10 F2
2 F3
3 F4
9 F5
6 F6
1 F7
7 F8
13 F9
11 F10
4 F11
5 F12
8 F13
FRAME 1
FRAME 2
1 X Y Z 1 X Y Z
2 X Y Z 2 X Y Z
3 X Y Z 3 X Y Z
4 X Y Z 4 X Y Z
N X Y Z N' X Y Z

FIG. 50

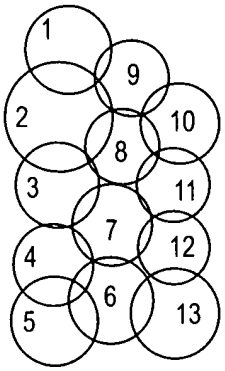

1
9
2
10
8
3
11
7
4
12
6
5
13

FIG. 51

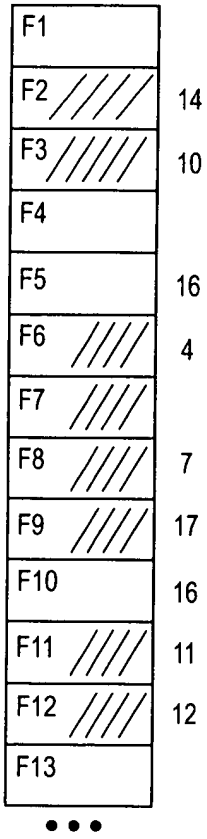


FIG. 52

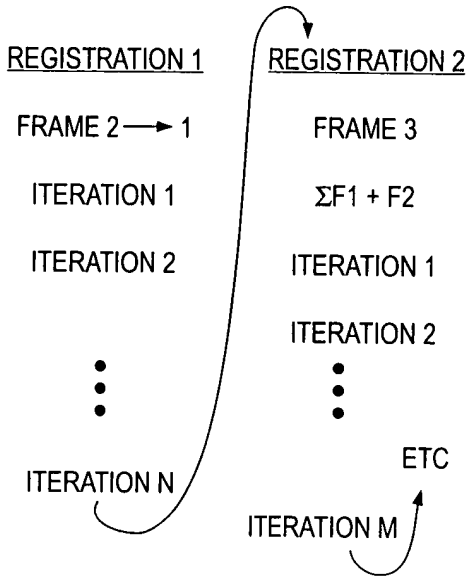
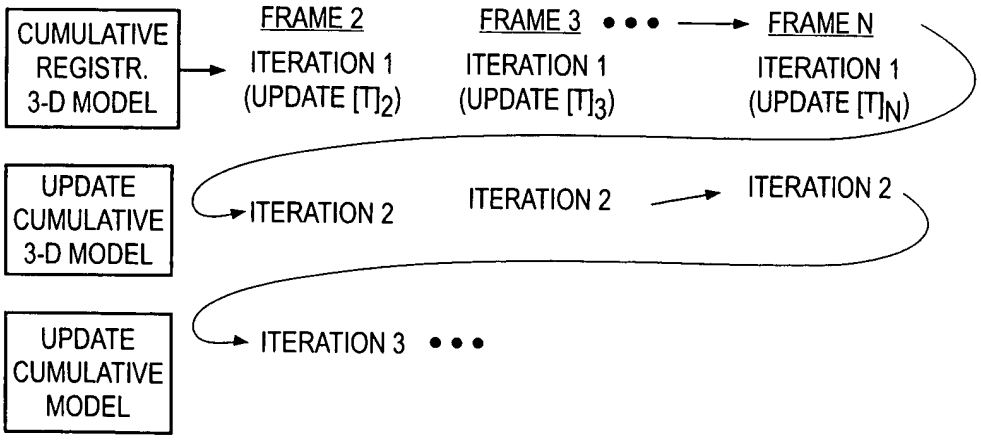


FIG. 53



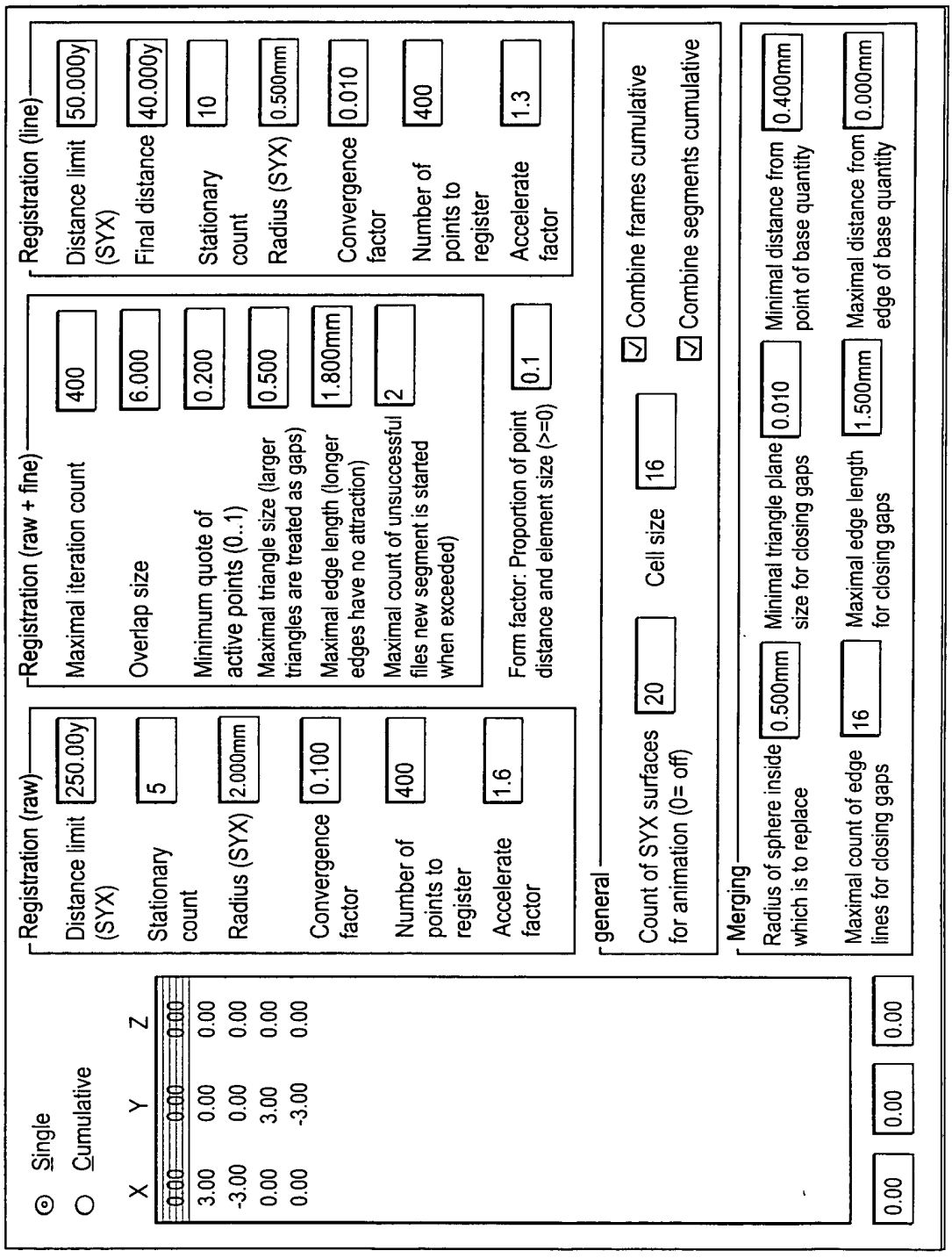

Single
Cumulative
X Y Z
0.00 0.00 0.00
3.00 0.00 0.00
-3.00 0.00 0.00
0.00 3.00 0.00
0.00 -3.00 0.00
0.00 0.00 0.00
Registration (raw)
Distance limit (SYX) 250.00y
Stationary count 5
Radius (SYX) 2.000mm
Convergence factor 0.100
Number of points to register 400
Accelerate factor 1.6
Registration (raw + fine)
Maximal iteration count 400
Overlap size 6.000
Minimum quote of active points (0..1) 0.200
Maximal triangle size (larger triangles are treated as gaps) 0.500
Maximal edge length (longer edges have no attraction) 1.800mm
Maximal count of unsuccessful files new segment is started when exceeded) 2
Form factor: Proportion of point distance and element size (>=0) 0.1
Registration (line)
Distance limit (SYX) 50.000y
Final distance 40.000y
Stationary count 10
Radius (SYX) 0.500mm
Convergence factor 0.010
Number of points to register 400
Accelerate factor 1.3
general
Count of SYX surfaces for animation (0= off) 20
Cell size 16
Combine frames cumulative
Combine segments cumulative
Merging
Radius of sphere inside which is to replace 0.500mm
Minimal triangle plane size for closing gaps 0.010
Minimal distance from point of base quantity 0.400mm
Maximal count of edge lines for closing gaps 16
Maximal edge length for closing gaps 1.500mm
Maximal distance from edge of base quantity 0.000mm

FIG. 54

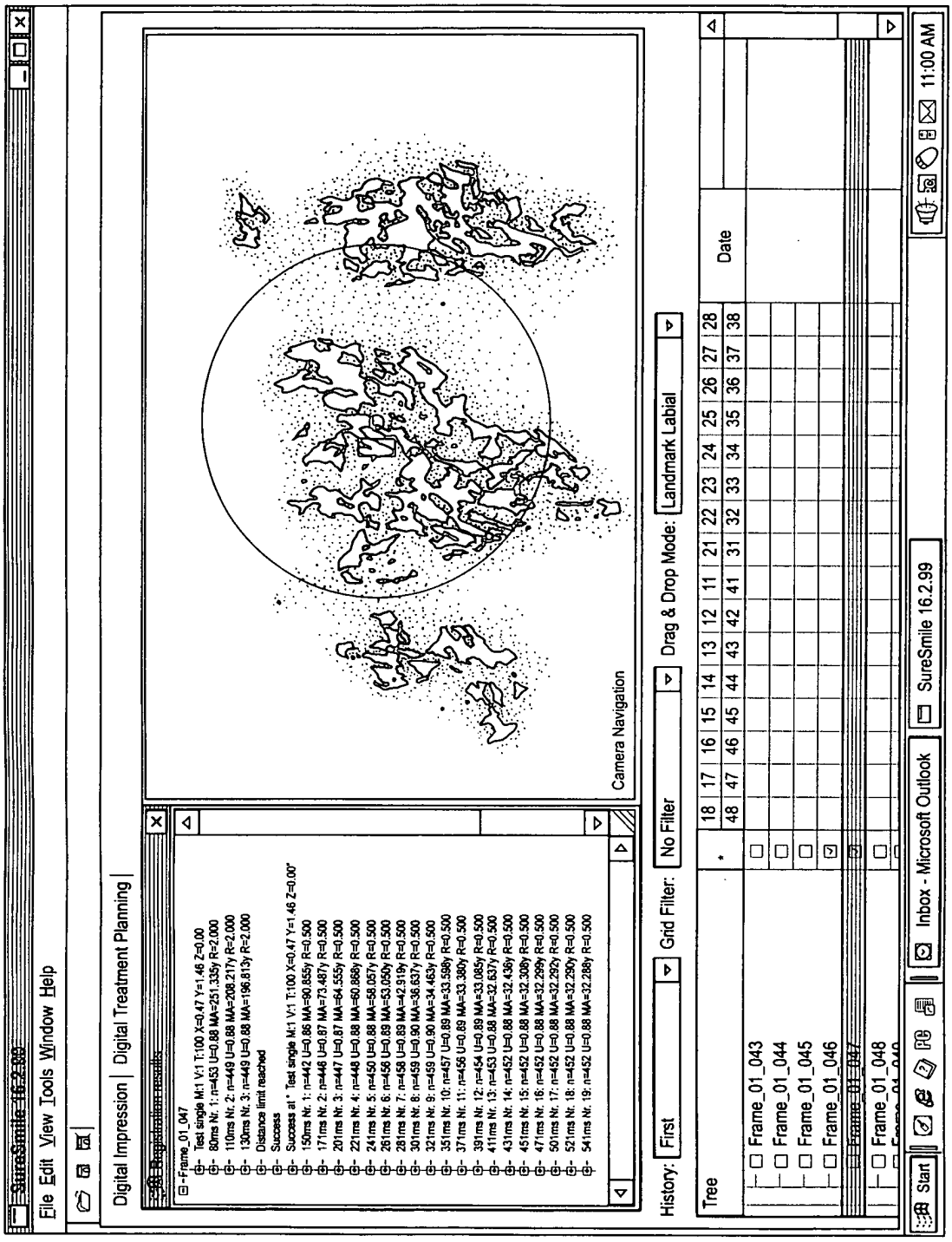

SureSmile 16.2.99
File Edit View Tools Window Help
Digital Impression | Digital Treatment Planning |
Registration results:
Frame_01_047
Test single M:1 V:1 T:100 X=0.47 Y=1.46 Z=0.00
80ms Nr. 1: n=453 U=0.88 MA=251.335y R=2.000
110ms Nr. 2: n=449 U=0.88 MA=208.217y R=2.000
130ms Nr. 3: n=449 U=0.88 MA=196.813y R=2.000
Distance limit reached
Success
Success at * Test single M:1 V:1 T:100 X=0.47 Y=1.46 Z=0.00°
150ms Nr. 1: n=442 U=0.86 MA=90.855y R=0.500
171ms Nr. 2: n=446 U=0.87 MA=73.487y R=0.500
201ms Nr. 3: n=447 U=0.87 MA=64.555y R=0.500
221ms Nr. 4: n=448 U=0.88 MA=60.868y R=0.500
241ms Nr. 5: n=450 U=0.88 MA=58.057y R=0.500
261ms Nr. 6: n=456 U=0.89 MA=53.050y R=0.500
281ms Nr. 7: n=458 U=0.89 MA=42.919y R=0.500
301ms Nr. 8: n=459 U=0.90 MA=36.637y R=0.500
321ms Nr. 9: n=459 U=0.90 MA=34.463y R=0.500
351ms Nr. 10: n=457 U=0.89 MA=33.598y R=0.500
371ms Nr. 11: n=456 U=0.89 MA=33.380y R=0.500
391ms Nr. 12: n=454 U=0.89 MA=33.085y R=0.500
411ms Nr. 13: n=453 U=0.88 MA=32.637y R=0.500
431ms Nr. 14: n=452 U=0.88 MA=32.436y R=0.500
451ms Nr. 15: n=452 U=0.88 MA=32.308y R=0.500
471ms Nr. 16: n=452 U=0.88 MA=32.299y R=0.500
501ms Nr. 17: n=452 U=0.88 MA=32.292y R=0.500
521ms Nr. 18: n=452 U=0.88 MA=32.290y R=0.500
541ms Nr. 19: n=452 U=0.88 MA=32.288y R=0.500
Camera Navigation
History: First
Grid Filter: No Filter
Drag & Drop Mode: Landmark Labial
Tree
Date
Frame_01_043
Frame_01_044
Frame_01_045
Frame_01_046
Frame_01_047
Frame_01_048
Start
Inbox - Microsoft Outlook
SureSmile 16.2.99
11:00 AM

FIG. 55

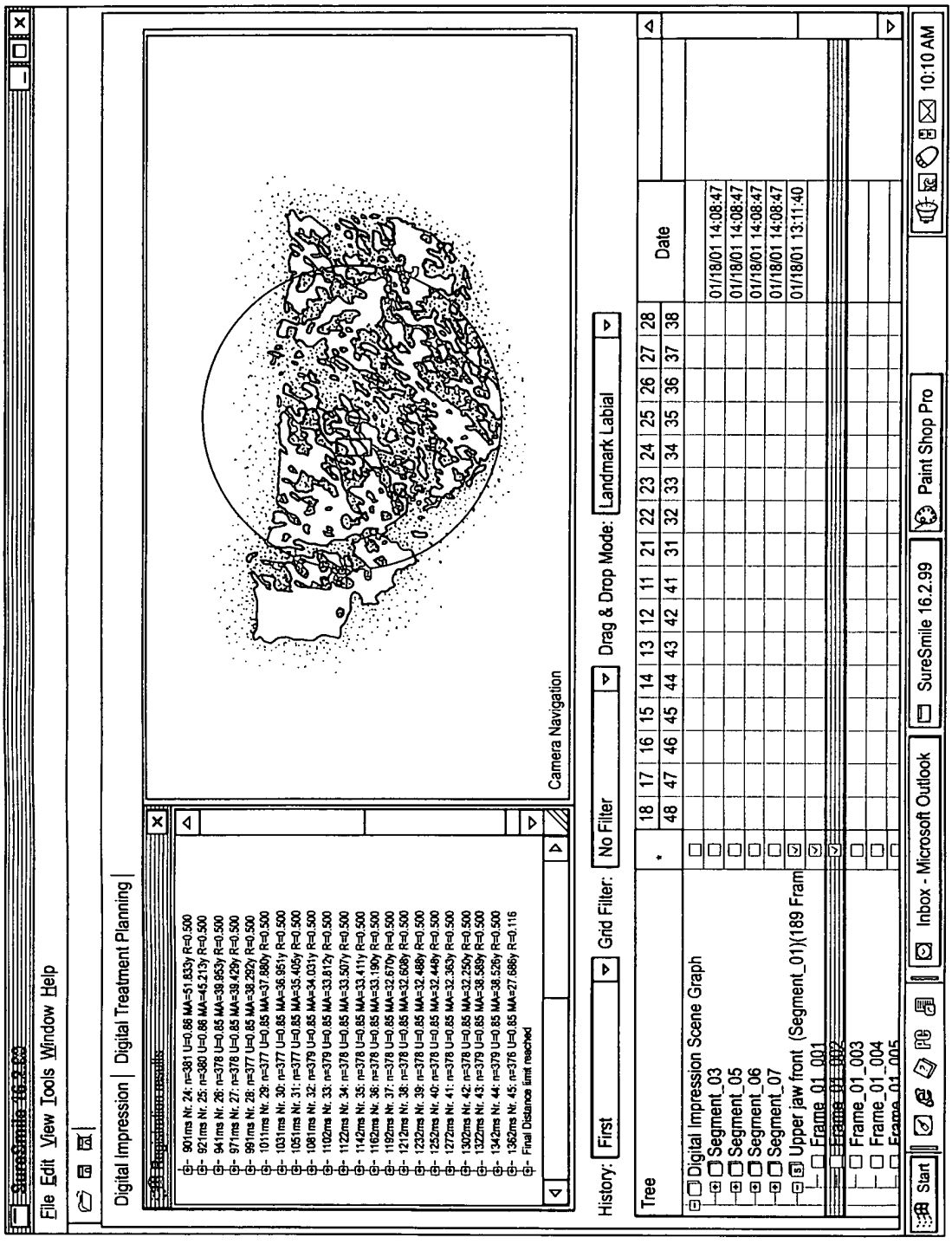

SureSmile 16.2.99
File Edit View Tools Window Help
Digital Impression | Digital Treatment Planning
Registration results:
901ms Nr. 24: n=381 U=0.86 MA=51.833y R=0.500
921ms Nr. 25: n=380 U=0.86 MA=45.213y R=0.500
941ms Nr. 26: n=378 U=0.85 MA=39.953y R=0.500
971ms Nr. 27: n=378 U=0.85 MA=39.429y R=0.500
991ms Nr. 28: n=377 U=0.85 MA=38.292y R=0.500
1011ms Nr. 29: n=377 U=0.85 MA=37.880y R=0.500
1031ms Nr. 30: n=377 U=0.85 MA=36.951y R=0.500
1051ms Nr. 31: n=377 U=0.85 MA=35.405y R=0.500
1081ms Nr. 32: n=379 U=0.85 MA=34.031y R=0.500
1102ms Nr. 33: n=379 U=0.85 MA=33.812y R=0.500
1122ms Nr. 34: n=378 U=0.85 MA=33.507y R=0.500
1142ms Nr. 35: n=378 U=0.85 MA=33.411y R=0.500
1162ms Nr. 36: n=378 U=0.85 MA=33.190y R=0.500
1192ms Nr. 37: n=378 U=0.85 MA=32.670y R=0.500
1212ms Nr. 38: n=378 U=0.85 MA=32.609y R=0.500
1232ms Nr. 39: n=378 U=0.85 MA=32.488y R=0.500
1252ms Nr. 40: n=378 U=0.85 MA=32.448y R=0.500
1272ms Nr. 41: n=378 U=0.85 MA=32.363y R=0.500
1302ms Nr. 42: n=378 U=0.85 MA=32.250y R=0.500
1322ms Nr. 43: n=379 U=0.85 MA=38.589y R=0.500
1342ms Nr. 44: n=379 U=0.85 MA=38.526y R=0.500
1362ms Nr. 45: n=376 U=0.85 MA=27.686y R=0.116
Final Distance limit reached
Camera Navigation
History: First
Grid Filter: No Filter
Drag & Drop Mode: Landmark Labial
Tree
Digital Impression Scene Graph
Segment_03
Segment_05
Segment_06
Segment_07
Upper jaw front (Segment_01)(189 Fram
Frame_01_001
Frame_01_002
Frame_01_003
Frame_01_004
Frame_01_005
Date
01/18/01 14:08:47
01/18/01 14:08:47
01/18/01 14:08:47
01/18/01 14:08:47
01/18/01 13:11:40
Start
Inbox - Microsoft Outlook
SureSmile 16.2.99
Paint Shop Pro
10:10 AM

FIG. 56

302
304
Z
302

DRAG AND DROP MODE
LANDMARK LABEL

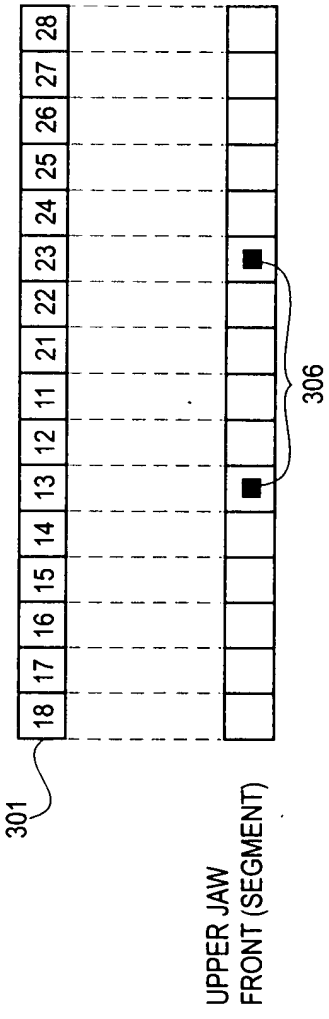

18
17
16
15
14
13
12
11
21
22
23
24
25
26
27
28
306
301
UPPER JAW
FRONT (SEGMENT)

FIG. 57

Fig. 58A

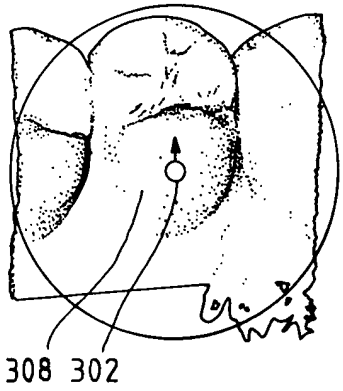


Fig. 58B

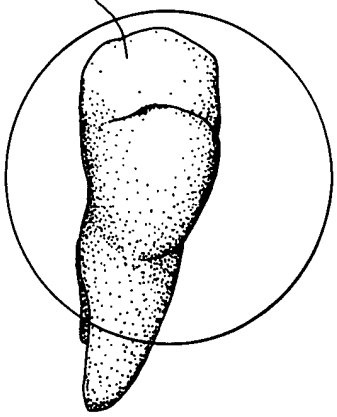


Fig. 58C

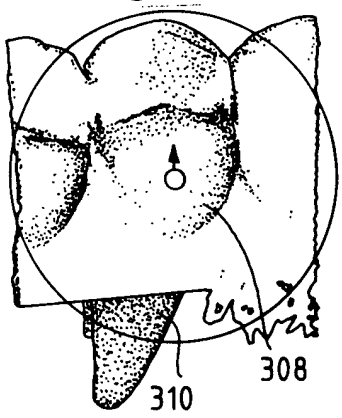


Fig. 58D

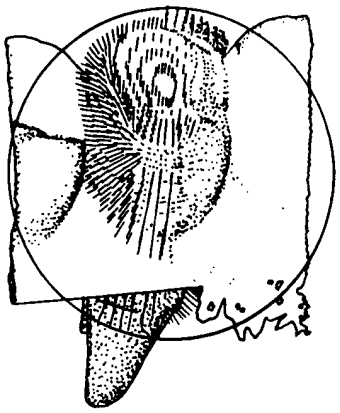


Fig. 58E

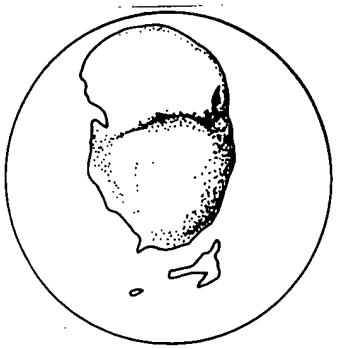


Fig. 58F

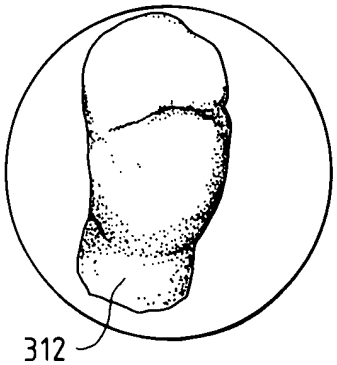
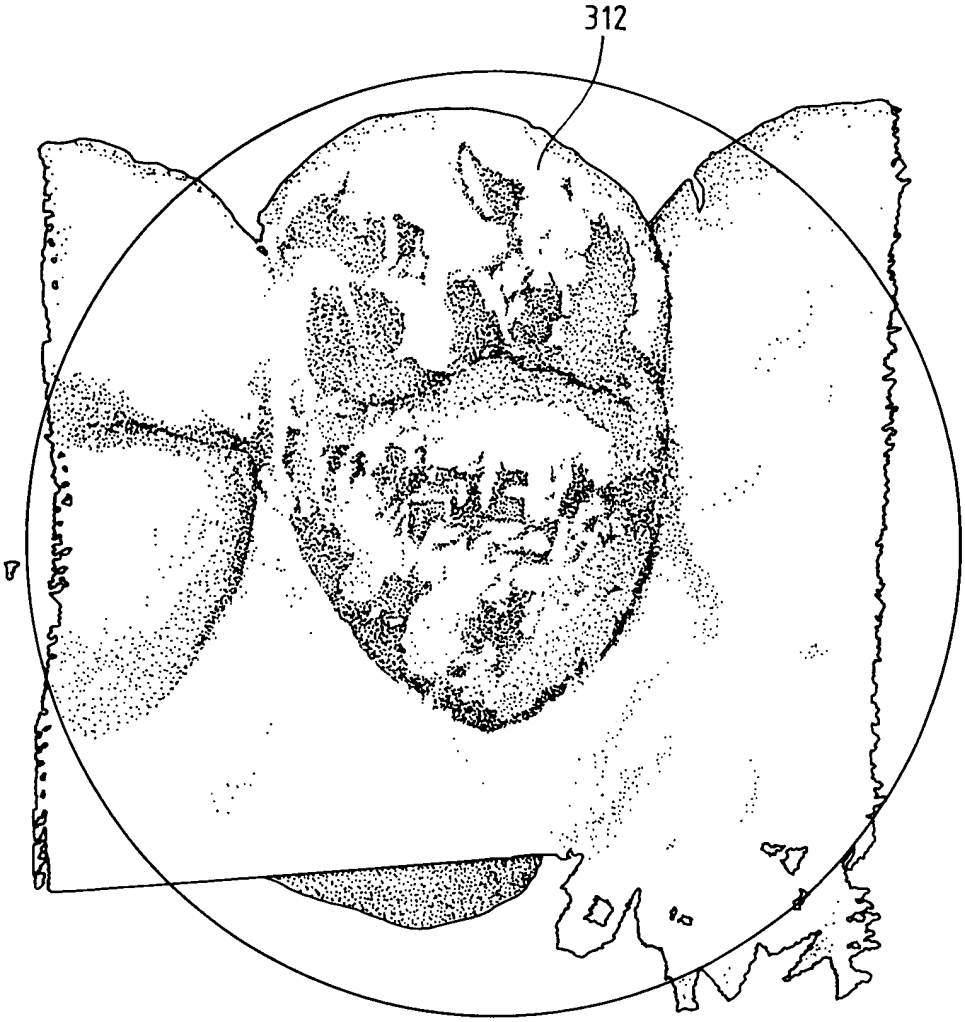


Fig. 59



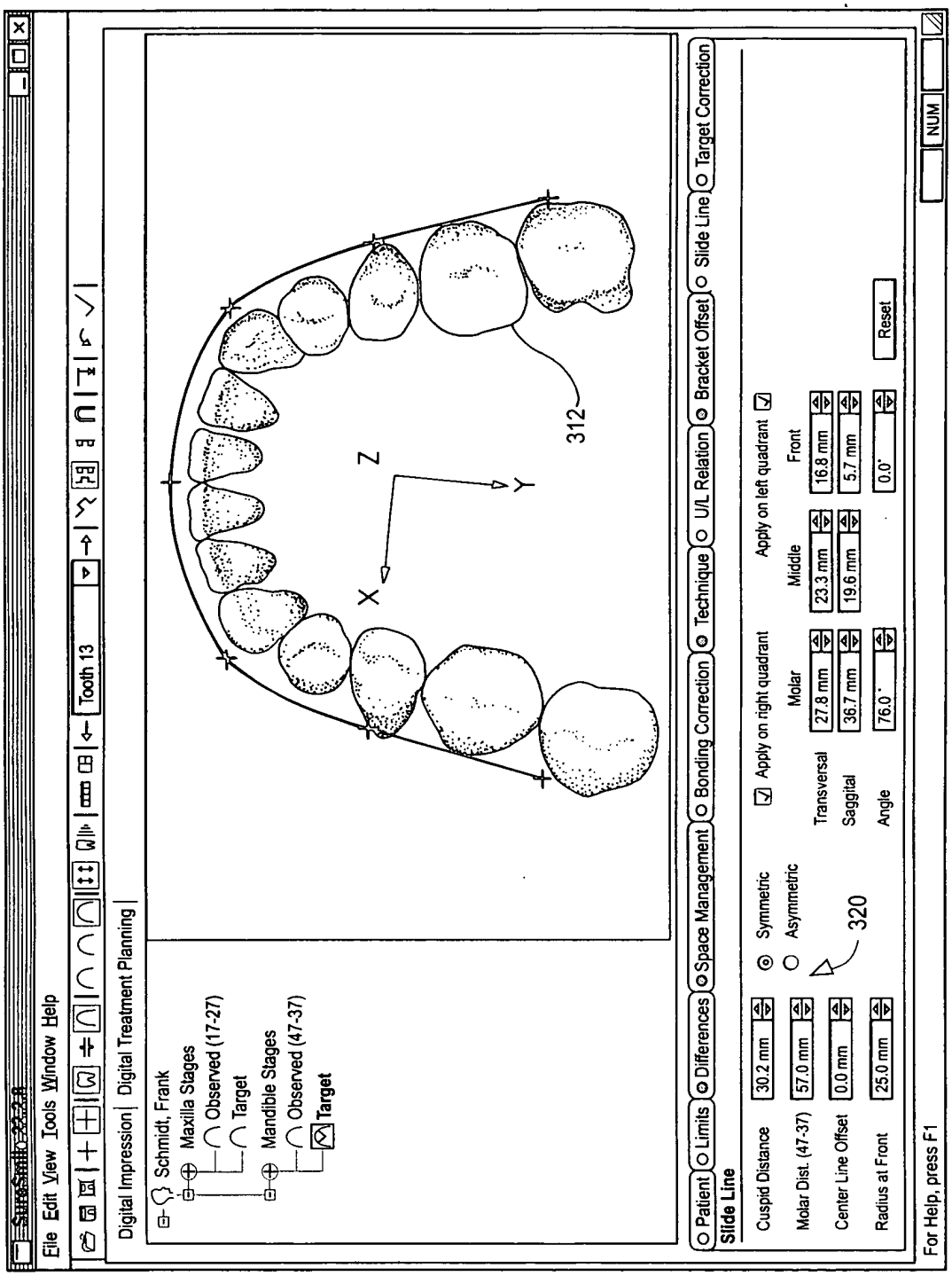

File Edit View Tools Window Help
Tooth 13
Digital Impression | Digital Treatment Planning
Schmidt, Frank
Maxilla Stages
Observed (17-27)
Target
Mandible Stages
Observed (47-37)
Target
312
Z
Y
X
Patient
Limits
Differences
Space Management
Bonding Correction
Technique
U/L Relation
Bracket Offset
Slide Line
Target Correction
Slide Line
Cuspid Distance
30.2 mm
Symmetric
Asymmetric
Apply on right quadrant
Apply on left quadrant
Molar
Middle
Front
Molar Dist. (47-37)
57.0 mm
Transversal
27.8 mm
23.3 mm
16.8 mm
Center Line Offset
0.0 mm
Saggital
36.7 mm
19.6 mm
5.7 mm
320
Radius at Front
25.0 mm
Angle
76.0°
0.0°
Reset
For Help, press F1
NUM

FIG. 60

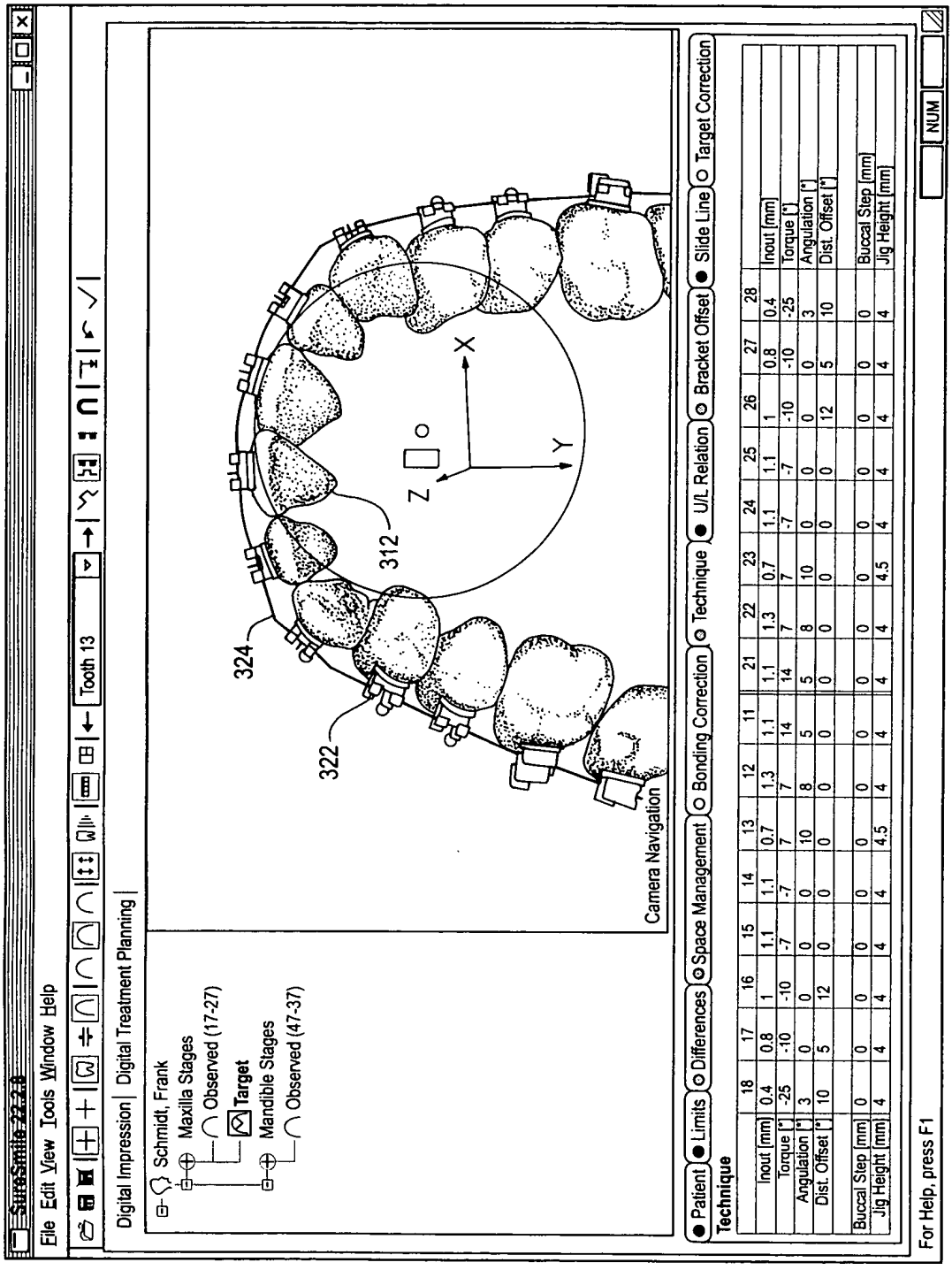

SureSmile
File Edit View Tools Window Help
Tooth 13
Digital Impression | Digital Treatment Planning |
Schmidt, Frank
Maxilla Stages
Observed (17-27)
Target
Mandible Stages
Observed (47-37)
324
322
312
Z
X
Y
Camera Navigation
Patient
Limits
Differences
Space Management
Bonding Correction
Technique
U/L Relation
Bracket Offset
Slide Line
Target Correction
Technique
For Help, press F1
NUM

FIG. 61

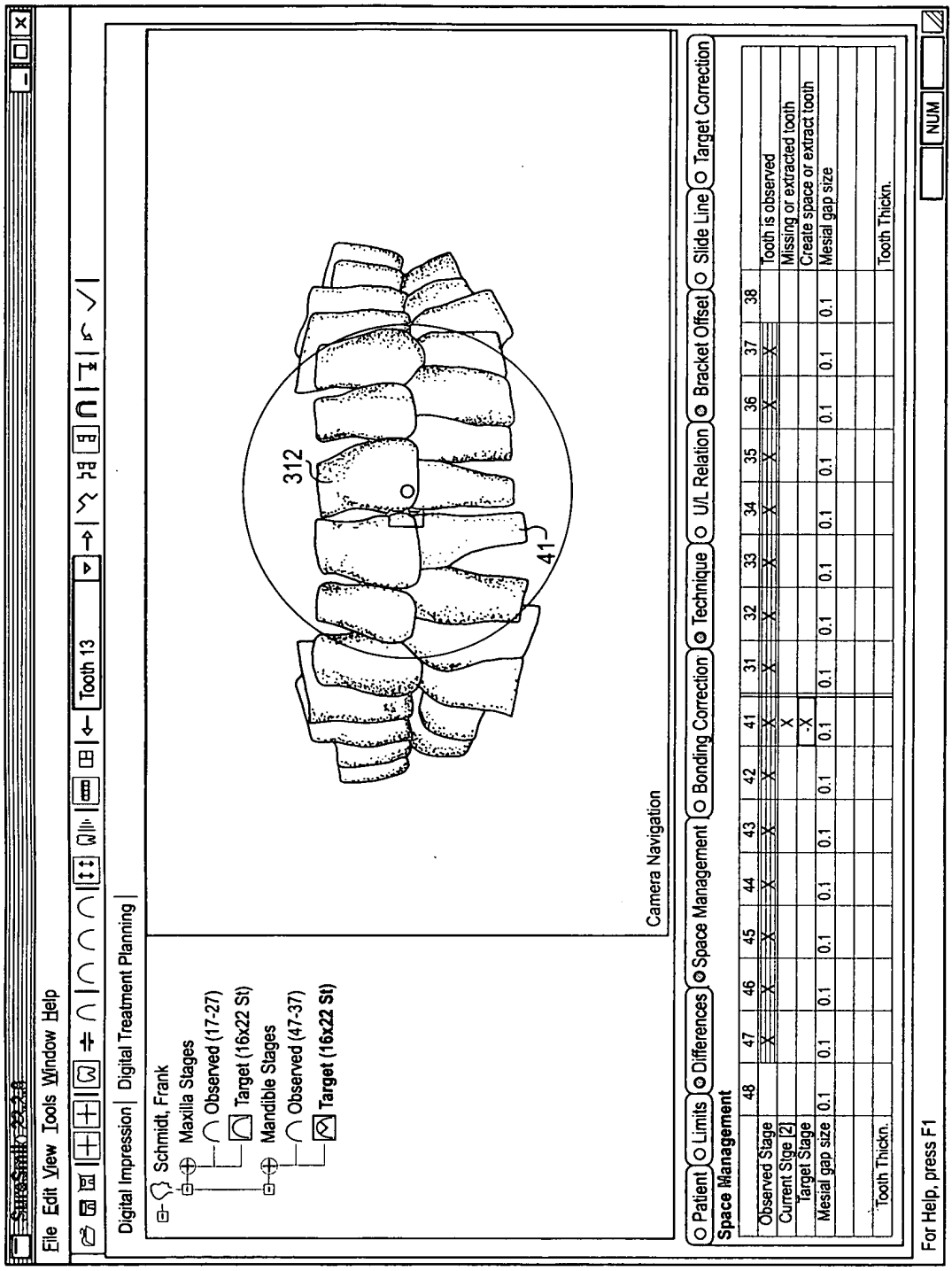

File Edit View Tools Window Help
Tooth 13
Digital Impression | Digital Treatment Planning |
Schmidt, Frank
Maxilla Stages
Observed (17-27)
Target (16x22 St)
Mandible Stages
Observed (47-37)
Target (16x22 St)
312
41
Camera Navigation
Patient
Limits
Differences
Space Management
Bonding Correction
Technique
U/L Relation
Bracket Offset
Slide Line
Target Correction
Space Management
Observed Stage
Current Stge [2]
Target Stage
Mesial gap size
Tooth Thickn.
Tooth is observed
Missing or extracted tooth
Create space or extract tooth
Mesial gap size
Tooth Thickn.
For Help, press F1
NUM

FIG. 62

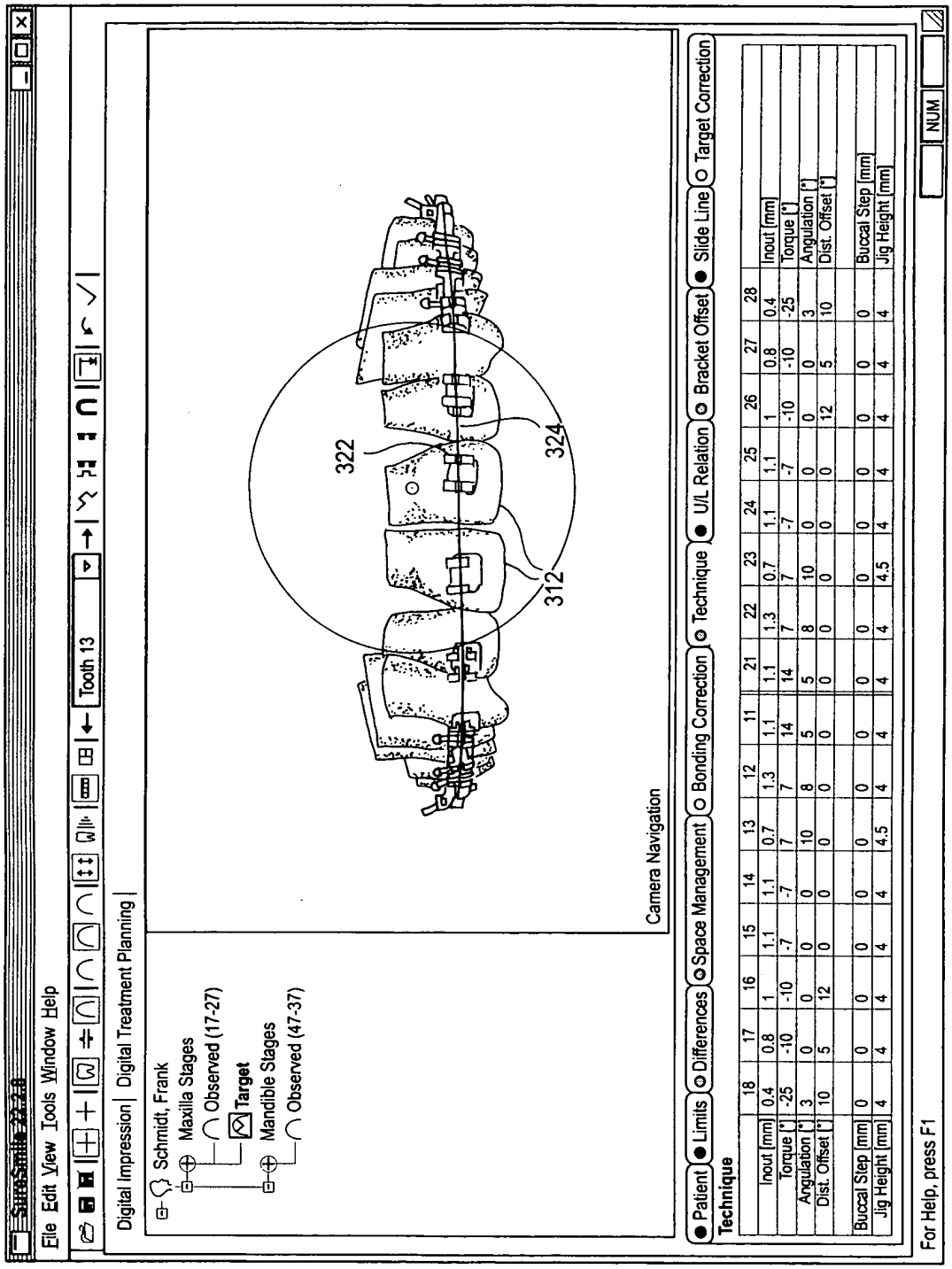

SureSmile
File Edit View Tools Window Help
Tooth 13
Digital Impression | Digital Treatment Planning
Schmidt, Frank
Maxilla Stages
Observed (17-27)
Target
Mandible Stages
Observed (47-37)
322
324
312
Camera Navigation
Patient
Limits
Differences
Space Management
Bonding Correction
Technique
U/L Relation
Bracket Offset
Slide Line
Target Correction
Technique
Inout [mm]
Torque [°]
Angulation [°]
Dist. Offset [°]
Buccal Step [mm]
Jig Height [mm]
For Help, press F1
NUM

FIG. 63

Fig. 64A

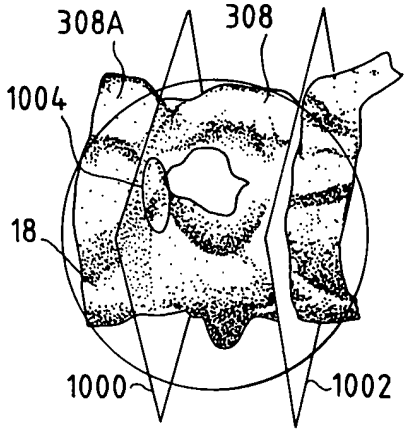


Fig. 64B

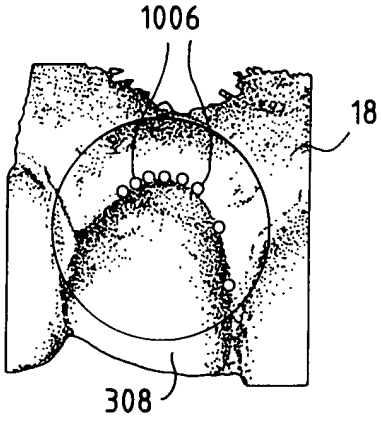


Fig. 64C

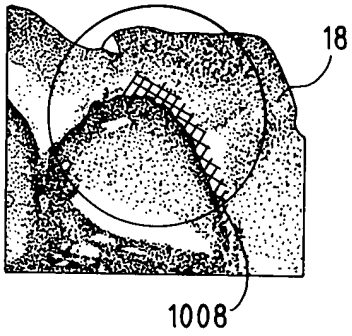


Fig. 64D

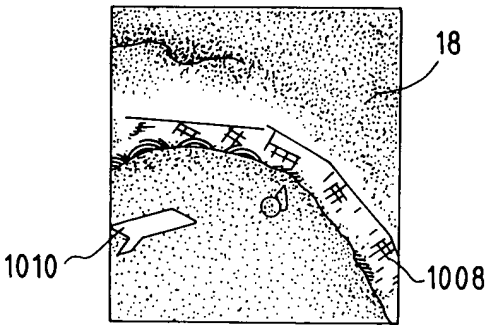
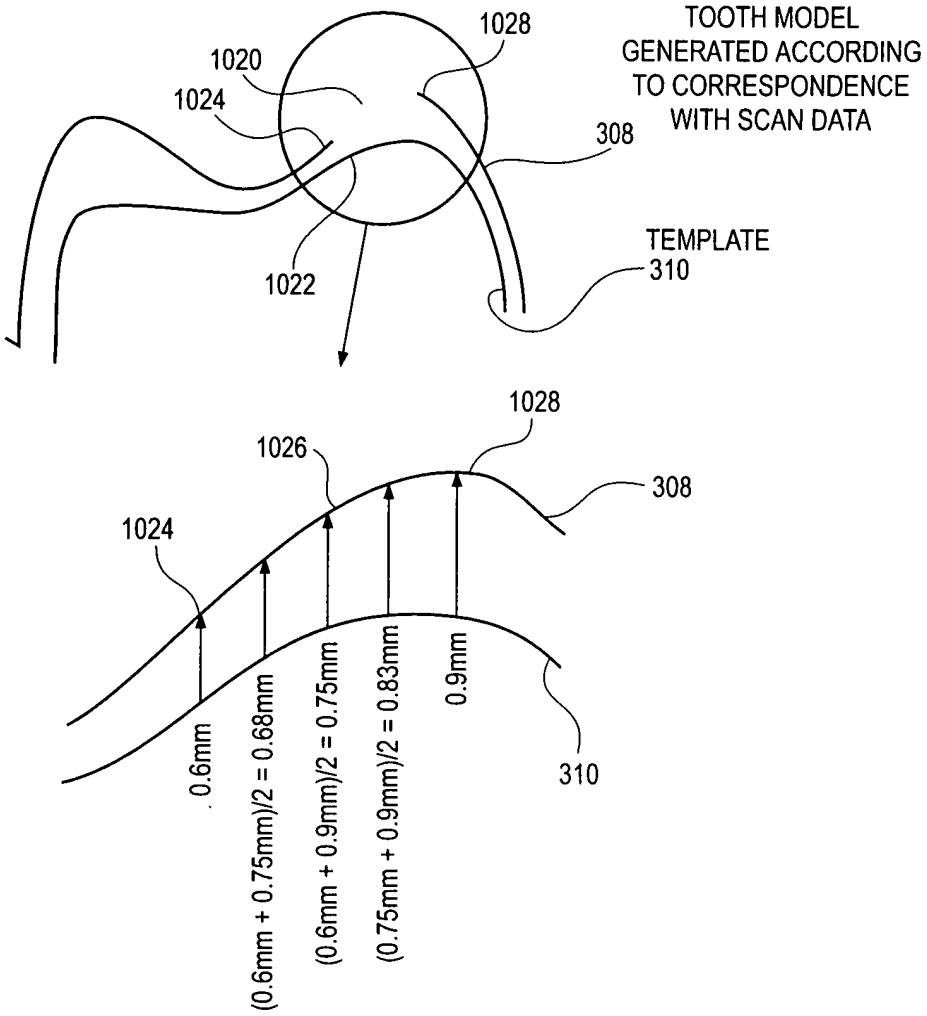


FIG. 65


1028
1020
1024
TOOTH MODEL
GENERATED ACCORDING
TO CORRESPONDENCE
WITH SCAN DATA
308
TEMPLATE
310
1022
1028
1026
308
1024
0.6mm
(0.6mm + 0.75mm)/2 = 0.68mm
(0.6mm + 0.9mm)/2 = 0.75mm
(0.75mm + 0.9mm)/2 = 0.83mm
0.9mm
310